ELECTRICAL WORLD

JUNE 6, 1931
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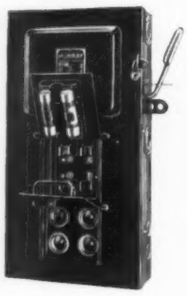
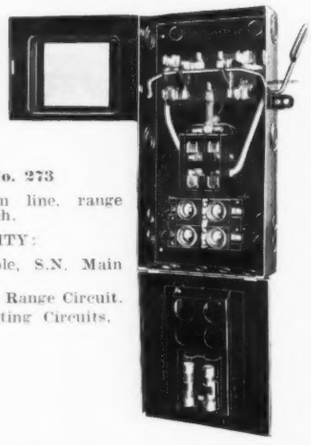


Catalog No. 273
Circuit Doors Open

Shows range circuits disconnected and fuses attached to door.



Catalog No. 273

Combination main line, range and lighting switch.

CAPACITY:

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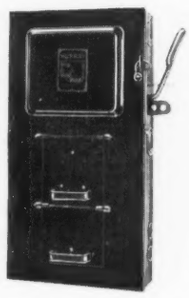
1—60 amp. 3 pole Range Circuit.
4—30 amp. Lighting Circuits.



Catalog No. 273
All Doors Closed

Catalog No. 786

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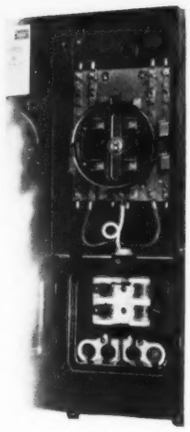
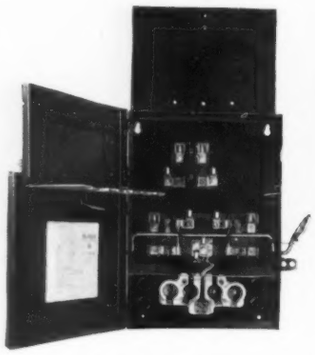


Catalog No. 787

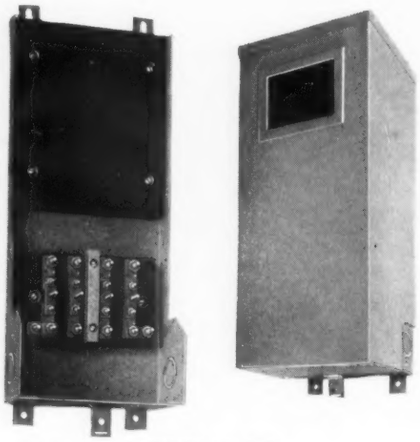
Meter switch and combination range and lighting fuse cabinet. Consists of Catalog No. 765 meter service switch and Catalog 4904 fuse attachment.

1—60 amp. 3 wire accessible fuse switch.
1—60 amp. 3 wire range circuit.
4—30 amp. lighting circuits.



Catalog No. 264

Main line fuses before meter and main line switch. 1—30 amp. water heater circuit. 1—60 amp. range circuit. 4—30 amp. lighting circuits.



Catalog No. 969

Outdoor Meter Box galvannealed steel and painted with gray duco.

Catalog No. 969

Interior View showing test block with removable straps.

Catalog No. 961

Meter Connection Test Block with removable straps for ready testing.

ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

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JUNE 6, 1931

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McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., New York, N. Y.

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CABLE ADDRESS: "*Machinist, N. Y.*"

Published weekly. $5 per year. 25 cents per copy. Entered as second-class matter, January 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Member A.B.C.
Member A.B.P.

NUMBER OF COPIES PRINTED THIS ISSUE, 17,960

NEW YORK District Office, 285 Madison Avenue
WASHINGTON, National Press Building
CHICAGO, 520 N. Michigan Avenue
PHILADELPHIA, 1600 Arch Street
CLEVELAND, 501 Guardian Building
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The OVER-ALL ECONOMY *of* QUALITY

WITH increasing cost per unit of system capacity but decreasing revenue per unit of energy sold, much attention is being paid to reducing system investment and operating costs.

These matters raise the question whether savings can be made by changing either standards of materials used in power systems or in the present methods of operation, or both.

Every part of an electric power plant is important and each has its share in controlling continuity of service and cost of operation.

Long experience has shown that original construction costs cannot be wisely reduced by the use of materials not generous in quality.

It has also been definitely established that maintenance costs and failures are reduced to a minimum by equipment of high quality.

It is certain that the big economies and the best overall results are obtained by the best equipment. And the best equipment is that which includes high quality of materials and expert technique, with a demonstrated background of long, reliable service.

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OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

ELECTRICAL WORLD

for the Week Ending

June 6, 1931

New York City rate case settled?

—**Public Service Commission** issues order to establish uniform schedules with institution of $1 minimum bill for domestic users. President Sloan's offer of August 1, 1930, revised—*p. 1042.*

—**Improve electric cyanide pots** through analytical study of elements and service characteristics. Result of research is a new type of steel-hardening furnace with longer-life elements—*p. 1057.*

Pinchot wants a national utility issue

—**Governors confer in Indiana.** Ambitious state heads make themselves heard, but Pennsylvania's chief executive gets the lion's share of the limelight by ignoring his assigned topic to denounce the utilities—*p. 1042.*

—**Wisconsin Commission right,** says State Supreme Court, in deducting sums contributed by customers for line extensions when the value of property for rate or security-issuing purposes is in question—*p. 1045.*

Benjamin Franklin never knew just exactly what electricity was, but he could still make practical application of it. We are in the same state. We shall not live long enough to know the essence of electricity.

WILLIS R. WHITNEY,
Director Research Laboratory,
General Electric Company.

Merchandising practices analyzed

—**Good merchandising studies** may be made from the right and doubtful practices of various companies. Survey reported in May 30 issue offers valuable information as further analyzed—*p. 1062.*

—**Electric pipe-line pumping** mutually profitable but virtually undeveloped. Uniform rates for this class of service seen as necessary if wider acceptance is to be realized—*p. 1052.*

—**Automatic control wins again** as users find uniformity and close adherence to current values giving best results prove unattainable with manual control in electrolytic work—*p. 1059.*

—**Single-phase faults analyzed** on direct-current calculating board. Technique of ascertaining the zero, positive and negative phase sequence components of dissymmetry discussed—*p. 1068.*

Copper at 8 cents a record low

Commission Cuts New York Edison Rates to Save $5,500,000 a Year

WITH issuance by the New York Public Service Commission on Tuesday afternoon of new uniform rate tariffs for the four affiliated chief light and power companies in Greater New York and their acceptance on behalf of these companies by President M. S. Sloan the long-deferred adjustment of energy charges in the metropolis was reached. After years of controversy and hearings, the matter reached its final stage last August, when Mr. Sloan proposed to cut the initial residential rate from 7 cents to 5 cents a kilowatt-hour plus a service charge of 60 cents a month. Many and exhaustive hearings followed. These closed in February and since that time the commission has had the subject under advisement. The companies to which the ruling applies are the New York Edison, the Brooklyn Edison, the United Electric Light & Power and the New York & Queens Electric Light & Power.

The commission's rates differ materially from those proposed by Mr. Sloan, but are drawn to effect about the same saving to customers on the basis of previous consumption. The commission estimates this saving at $5,500,000 a year. Mr. Sloan's original estimate of the saving under the rates he advocated was $5,000,000, but he afterward increased this estimate.

Instead of Mr. Sloan's proposed service charge the commission has instituted a minimum flat rate of $1 a month, for which the consumer will be entitled to use 10 kw.-hr. For the next 5 kw.-hr. the rate will be 6 cents, and then 5 cents will be charged for any excess over 15 kw.-hr.

The commercial rate, which involves installation of special demand meters, will be $1 per meter per month per kilowatt of maximum demand where the demand exceeds 1 kw. plus an energy charge amounting to $1 per meter per month for the first 10 kw.-hr., 6 cents for the next 40, 5 cents for the next 4,950 and 4 cents for all over 5,000.

The estimated saving is divided as $2,400,000 to domestic consumers and $2,100,000 to commercial users. Householders whose bills have been, on the average, less than $1.96 a month—estimated to number 50 per cent of total residential customers—will find that sum increased. Those who have paid $1.96 or more will now pay less. Small commercial users will also pay more in some cases, though not in so great numbers as residential users. Large commercial users will find their bills decreased.

In a part of its ruling dealing with the resale or submetering of energy the commission declares that it does not look with favor upon resale. A further clause prohibits the purchase of energy for resale at residence rates and the commission believes that to pay the commercial rates will not be profitable except in cases where large amounts are used.

The decision, written by Chairman Milo R. Maltbie, was unanimous. Commissioner George R. Lunn was absent because of illness.

If the new rates do not accomplish their purpose, the commission says, further reductions will be ordered. In the matter of a coal surcharge the commission observes that coal is now so low that its price can have no effect on costs for a year at least.

This decision of the commission is significant in that it is based upon recognition of the desirability of uniform rates, of promotional rates and of the legitimacy of a minimum charge. The minimum charge was considered better psychologically than the service charge proposed by Mr. Sloan.

Great credit is given Mr. Sloan and Mr. Maltbie for their factual handling of the rate discussions and the development of logical principles for application to complex conditions. Congratulations are being given Mr. Sloan by other utility men for the courage and ability he has displayed in dealing with a long-deferred and delicate aspect of the New York utility situation.

Protests against the new rates and applications for a rehearing have come from the New York Real Estate Board, which calls them unfair to landlords, and the Conference for Progressive Labor Action, which says they are "atrociously unfair to the working people" because of their increase to very small consumers.

▼

FRIENDLY POLITICAL FOES

—Keystone View Co.

Roosevelt and Pinchot are probably not weaving a bi-partisan anti-utility plot but merely discussing French Lick weather

▼

Pinchot Wants Federal Control Over Utilities

DISTURBING questions were not kept out of the agenda of the annual Governors' Conference, held at French Lick, Ind., this week, whether or not an effort was made by the managers to avoid them. Among these questions was the proper attitude of political parties toward utility companies. Two governors especially interested in this question and especially prominent in their respective parties as possible contenders for the presidential nomination next year were present in the persons of Franklin D. Roosevelt of New York and Gifford Pinchot of Pennsylvania. Governor Roosevelt stuck to the topic assigned him, "Land Utilization and State Planning," but Governor Pinchot ignored his prescribed topic of timber conservation and launched out into an attack on the utility industry couched in his familiar hyperbolic style, with a characteristic apportionment of "controlling interests."

The electric industry, he said, starting with nothing two generations ago, largely through lack of proper regulation had expanded until now it could boast an investment of approximately $12,000,000,000 in the nation. Ninety-five per cent of the output of electrical energy was controlled by four major groups — the Morgan-Mellon group, with 57.12 per cent; the North American group, with 14.03 per cent; the Harris Forbes group, with 12.36 per cent, and the Insull group, with 10.80 per cent.

Everything indicated, the Governor continued, that a merger was in contemplation which would place this 95 per cent of the electrical output within the control of one huge monopoly, with the Mellon-Morgan group in control of more than 70 per cent of the total. Only 2.40 per cent was controlled by municipalities or other governmental agencies, while 3.20 per cent was represented by unidentified independents. "These interests work together harmoniously under a common policy and toward a common end, which is to milk the public," he exclaimed. "I call it graft and I am well within my right." The Governor, in fact, pilloried it as "the most

gigantic graft ever imposed or collected by any single business since the word began."

"I wish to express my firm conviction," Mr. Pinchot concluded, "based on no little practical experience, that the question of the public utilities cannot be settled by the individual states acting alone; that the effort to settle it by individual states acting alone is hopeless from the start; that the problem is essentially national in its character and that it can be solved only under the leadership and by the action of the nation itself, assisted and supported, of course, by the co-ordinated action of the individual states."

In the discussion which followed Governor Pinchot's speech Governor Roosevelt told of the plans for the development of the power resources of the St. Lawrence River under state auspices; Governor Henry S. Caulfield of Missouri contended that it would be calamitous to invite the federal government to take over intrastate regulation of public utilities and that the states could band together and fight the public service corporations just as effectively without federal intervention, and Governor Floyd B. Olson of Minnesota, a Farmer-Laborite, praised Mr. Pinchot's speech and proposed that the governors next year take up the subject of government ownership and operation.

Samuel M. Vauclain, chairman of the board of the Baldwin Locomotive Works, sent a telegram to every governor attending the conference denouncing the address made by Governor Pinchot and declaring that "his so-called program of action will endanger constitutional government and also delay the return of prosperity."

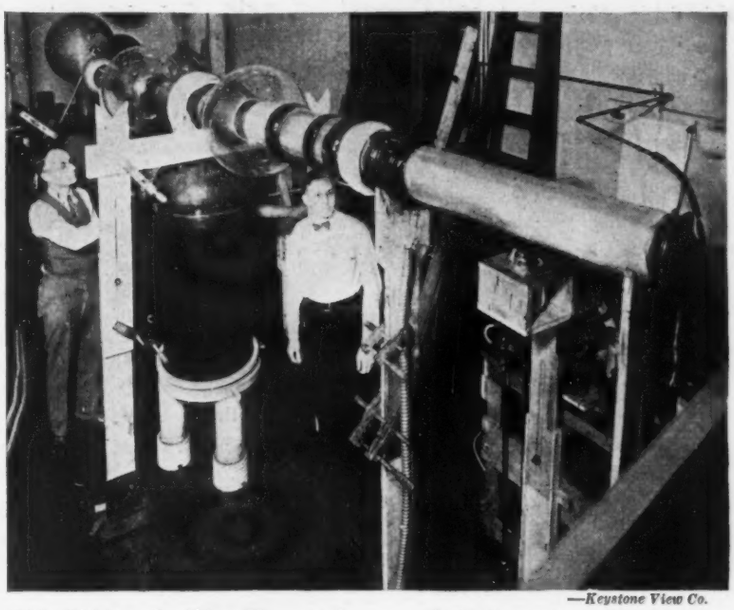
▼

Brooklyn Edison Accused of Unfair "Lay-offs"

AN ATTACK WAS LAUNCHED against the Brooklyn Edison Company this week in a letter sent to Lieutenant-Governor Lehman by Representative F. H. La Guardia, who accuses the company of "laying off" 1,600 employees, while other commercial concerns, meeting keen competition and many of them operating at a loss, are being urged not to discharge employees and to maintain standard wages. Mr. La Guardia calls the action of the Brooklyn Edison Company "most unfair" and declares that "this company and the affiliated companies should be ordered, in no uncertain terms, to reinstate every employee discharged within the last three months."

President Sloan responded to Mr. La Guardia's onslaught by the statement that the men laid off belonged in no instance to the company's regular forces but were outside men employed on construction jobs who had been carried over the winter and were reluctantly discharged when the appropriation for the work on which they were employed was exhausted.

ELECTRICITY ENLISTED IN FIGHT AGAINST CANCER



—Keystone View Co.

This 900-kv. Coolidge X-ray tube, one of the largest of its kind, was made by the General Electric Company for hospital use in cancer research. Photographs can be taken with it through a 4-in. iron plate.

▼ ▼ ▼

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Washington Water Power Cuts Rates in 134 Towns

EFFECTIVE JULY 1, the Washington Water Power Company will reduce commercial lighting rates to customers in territories outside of Spokane and residential rates in these territories with the exception of Coeur d'Alene, Idaho. The reduction will affect approximately 25,000 customers in 134 towns and will result in an annual saving of $150,000. All towns except Spokane and Coeur d'Alene are now on uniform rates.

▼

Pacific Power & Light Rates Down 10 per Cent

REDUCTION IN residential and commercial lighting schedules of the Pacific Power & Light Company in Oregon having the effect of reducing the company's revenues from these sources about 10 per cent have been ordered by Charles M. Thomas, Public Utilities Commissioner of the state. Coincidentally the company filed similar reductions in these schedules in its Washington territory. These reductions amount to about $95,000 in Oregon and $135,000 in Washington. In general the medium user of service is affected most advantageously since the reductions were made largely in the top rates, with some readjustment in the length of the blocks. The room count and other load-factor features in Washington have been removed, as have prompt-payment discounts.

The Oregon commissioner set the bare physical value of the Oregon properties of the company at $9,003,027.

▼

Potomac Electric Rates Once More in Dispute

ESTABLISHMENT BY THE Public Utilities Commission of the District of Columbia of a lower electric rate for the Potomac Electric Power Company through modification of the equity consent decree under which rates have for some years been regulated appeared probable last week as a three-day rate hearing closed in the capital.

Challenging the right of the commission to hold the hearing or modify the consent decree of 1925, under which half the earnings in excess of 7½ per cent in any year are credited to customers in the form of rate reductions for the ensuing year, S. Russell Bowen, vice-president and general counsel of the company, held that the consent de-

cree is a binding contract on the commission and cannot be changed against the wish of the company. R. B. Keech, people's counsel, and William A. Roberts, counsel for the commission, cited United States Supreme Court decisions to prove that the commission has authority to adopt a new sliding-rate scale.

▼

Power and Regulation in State Legislatures

ALABAMA.—The legislative committee investigating electric utility rates and valuations has completed its public hearings. Hugh White, president of the Public Service Commission, proposed an extension of the commission's authority to enable it to require electric utilities to buy energy from one another when the commission finds this to be the most efficient or economical means of supply and that the fees payable to the state by utilities for supervision and inspection should be substantially increased. Thomas W. Martin, president Alabama Power Company, protested against increased utility taxation. He defended export of power as being in the interest of Alabama consumers and expressed willingness to co-operate in the solution of the Muscle Shoals problem. A state nitrate plant for the manufacture of commercial fertilizer would be authorized under terms of a bill passed by the Upper House to permit the state to issue $20,000,000 in long-term bonds to either take over the Muscle Shoals nitrate plant or to erect a new one.

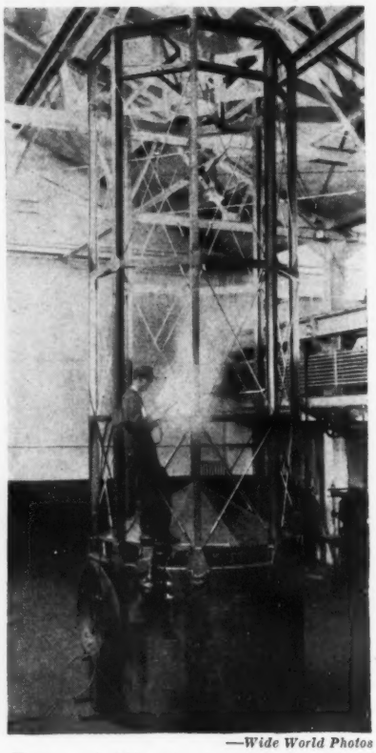
FLORIDA.—A bill has been introduced in the Senate, at the request of Governor Carlton, proposing to levy a tax of 1½ per cent on the gross receipts of gas, electric, telephone and telegraph companies, including municipal plants.

NORTH CAROLINA.—The Legislature has adjourned. Among the measures adopted was the one to increase the regulatory power of the Corporation Commission over utilities which was described in the ELECTRICAL WORLD for May 2 (page 795). The only other bills passed affecting utilities increased franchise taxes from 2 to 5 per cent and income taxes on all corporations from 4½ to 5 per cent.

PENNSYLVANIA.—Governor Pinchot has approved a bill providing that corporations to supply water or electricity and corporations formed by the merger of such corporations may finance, lease and operate corporate property.

WISCONSIN. — The House has passed the Duncan bill enlarging the powers of the Railroad Commission, and it has gone to the Governor.

ELECTRIC WELDING WILL HELP ASTRONOMIC RESEARCH



—*Wide World Photos*

Extra rigidity is imparted to this 22-ft. telescope tube for the Perkins Observatory at Ohio Wesleyan University by the arc-welding of joints heretofore bolted or riveted together

▼

N.E.W.A. Asks for Industry Conference

A REQUEST TO THE Federal Trade Commission that it call an industry conference during the fall convention of the National Electrical Wholesalers' Association, which will be held in Cincinnati, probably in the week of November 9, was perhaps the most important action taken by the body last named when it met at Hot Springs, Va., last week. Sixty-one wholesalers assembled at the Virginia resort, a comparatively good figure in present business conditions.

B. W. Clark, general manager Westinghouse Electric Supply Company, chairman of the association, predicted an early though slow business revival. J. F. Owens, vice-president National Electric Light Association, speaking to the question "What About Merchandising?" exhorted the members to "get together" and "pull together." He said that the central station should not monopolize the merchandising field, but should recognize that the retailer performs an economic function and approach merchandising problems in a spirit of co-operation and fairness.

The betterment committee of the association announced that it had established a new standing committee on operating, which would investigate methods used by members to reduce operating costs and improve turnover. In the course of the convention the jobbers' salesman plan was explained to the free-lance group. Mr. Clark was re-elected chairman and F. R. Elliott, Elliott-Lewis Electric Company, Philadelphia, vice-chairman.

▼

Federal Trade Men Report on St. Louis Region Power

FAVORABLE ANALYSIS of the rates of the Union Electric Light & Power Company, St. Louis, which were said by one commission examiner to bring average domestic bills among the lowest in the nation; a report on the Union Electric Light & Power Company of Illinois, owner of the Cahokia and Venice plants, and engineering descriptions of these plants and of the Ashley Street plant in St. Louis and the coming Bagnell hydro plant on the Osage River took up a large part of the continued hearings by the Federal Trade Commission into North American Company properties on Wednesday, Thursday and Friday of last week.

M. S. Anderson, one of the commission's accountant-examiners, recited the history of the Mississippi River Power Company and explained why the foundations built in the Keokuk hydro plant for five more units were still unoccupied and, on account of the reduced cost of generating power by steam, seemed likely long to remain so. The book plant and property account of this company, including the 134-mile double-circuit steel-tower 110-kv. transmission line to St. Louis, about 175 circuit miles of lines rated at 66 kv. or less and five step-down substations, is equivalent to $355 per kilowatt of installed capacity, he said. The electric revenues in no year have brought an adequate return on that amount.

Prior to its acquisition by the North American Company, Mr. Anderson said, the Mississippi River Power Company had issued securities to the amount of $34,999,500 for property which cost $14,102,500. Adding the cost of extra construction, securities to the total of $45,118,000 were issued against expenditures of $22,570,418.

Transactions incident to the acquisition of stock of the Western Power Corporation by the North American Company were described in testimony given on June 2.

"Power Trust" Vigorously Attacked in Louisiana

THAT LOUISIANA is "apparently one of the worst-ridden power and gas trust states in the Union," that this is due to the policy of Governor Huey Long, who is alleged to be controlled by his "buddy and patron," Harvey Couch, and that funds have been withheld from the Public Service Commission by the Governor and the Louisiana Secretary of State to prevent an investigation of the charges against the "trust," are accusations just made in an old-fashioned stump speech of the "O tempora! O mores!" variety by George Seth Guion, formerly Assistant Attorney-General of the state, who is a candidate for Governor to succeed Mr. Long, now United States Senator-elect.

Mr. Guion devotes most of his attention to the question of natural gas, which he charges is furnished to Louisiana consumers only at rates which the great majority cannot afford to pay; but he also dwells on the fact that the price of energy in New Orleans—9.1 cents a kilowatt-hour plus a service charge—tops the list of rates in cities of the United States containing 150,000 people or more. He praises highly Francis Williams, chairman of the Public Service Commission—who has himself protested against the alleged withholding of funds from the commission—and promises, if elected Governor, to work for "cheap power and cheap fuel."

▼

Customers' Contributions Excluded from Valuation

PAYMENTS BY CUSTOMERS of public utilities for extensions of equipment required to furnish service may not properly be included in a valuation upon which securities may be issued or upon which rates may be based, says the Wisconsin Supreme Court in a decision just rendered. The Wisconsin Hydro-Electric Company purchased the Luck Light & Power Company in 1923, prior to which time the latter had received from customers payments aggregating $12,034 for line extensions. After the sale the Wisconsin company applied to the Railroad Commission for permission to issue securities amounting to the purchase price of $80,000. The commission held that securities might be issued only on the amount of the purchase price less the amount of payments by customers. The Dane County Circuit Court sustained the utility's contentions that the property had been purchased free of all encumbrances, that the customers' contributions were not held in trust and that there was no lien on the property, and the commission then appealed to the Supreme Court, which says:

> There is no basis for the contention that the commission erred in deducting from the appraised value of the entire property the amount of the original contributions without making any allowances for depreciation on the property representing those contributions. . . .
>
> It is undisputed that the rate schedule of the Luck company was construed upon a basis which did not provide for a return to the utility upon the capital which its customers had donated and that it did not permit the utility to earn a return upon these donations. Although a rate base and a security base are not necessarily the same, still when it becomes necessary to determine whether the security base affords "reasonable protection to purchasers of securities" the rate base is necessarily involved.

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Apartment-House Metering Dealt with in Omaha

APARTMENT-HOUSE OWNERS in Omaha are permitted by a recent revision of the city's light and power rate ordinance to buy electrical energy for their entire building and to pass the charge on to tenants as part of the rent. The provision applies also to office buildings.

This new schedule, Roy E. Page, general manager Nebraska Power Company, is quoted as saying, has been provided so that owners who desire to equip apartments with electric stoves, refrigerators and other appliances and include the price of electricity in the rent can do so. The ordinance specifically prohibits any person buying electricity on a master meter and submetering it at a profit. Nor may the owner of adjoining houses serve them from the same meter, though the prohibition does not apply to unfurnished "duplexes" or connected flats.

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Los Angeles Power Board Largest Budget Approved

PROVIDING FOR EXTENSIONS and improvements to the city-owned water and electric system and for completion of land purchases in Owens Valley, the 1931-32 budget of the Los Angeles Department of Water and Power has been approved by the Board of Water and Power Commissioners. It calls for $61,000,000 and is the largest ever submitted by the department, according to Arthur Strasburger, president of the board. Projected expenditures on the power system include installation of a third unit in power plant No. 2, providing 20,500 hp. additional capacity; a new power-distributing station in Hollywood and extensions of underground electric conduits in Hollywood, Los Angeles and San Pedro.

Mr. Strasburger has issued a statement to the citizens of Los Angeles, "to clarify a confusing situation," in which he says that "the Municipal Light and Power Defense League has absolutely no connection, official or unofficial, with the Department of Water and Power and has no authority to speak for or on behalf of the department," and adds: "Friends of the Department of Water and Power are urged not to contribute any funds to the Municipal Light and Power Defense League under the conception that such contribution or membership is either authorized or approved by the

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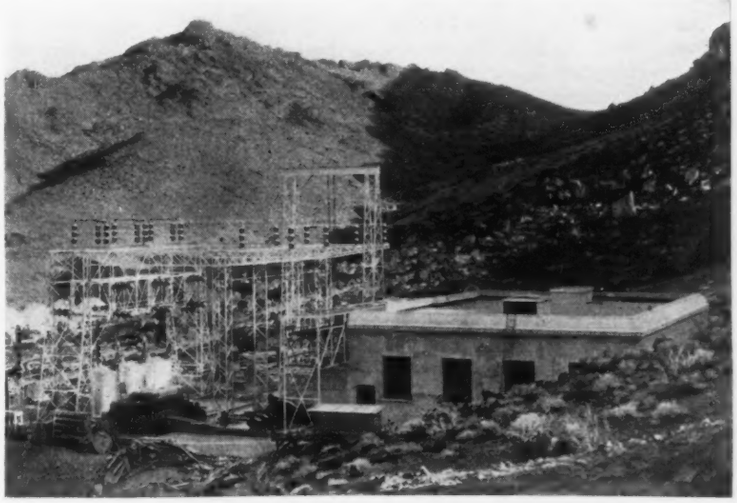
LONG EONS VIEW A GREATER FORCE THAN NAPOLEON'S



This 15,000-kva. substation at the site of Hoover Dam is the terminal of the 132-kv., 225-mile transmission line built by the Southern Sierras Power Company from San Bernardino to supply power for construction.

TURKEY'S TRANSFORMATION INCLUDES MODERN LIGHTING

—*Wide World Photos*

Galata, famous suburb of Constantinople, is here viewed from Stamboul during a recent illumination

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Department of Water and Power or the Board of Water and Power Commissioners."

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San Diego's Electrical Doctors Disagree

CITY OFFICIALS, legal advisers and engineers for the city of San Diego are still attempting to determine whether an allotment of 90,000,000 kw. of Hoover Dam power would turn out a "gold brick" or a profitable acquisition.

W. H. Bowker, originally employed by the City Council to estimate the cost of bringing Boulder power to San Diego, advised the city that the cost would run in the neighborhood of $1,500,000. Not satisfied with this report, the city engaged Nelson A. Eckart, city electrical engineer of San Francisco. His estimate exceeded $4,400,000, and he advised the construction of a steam standby plant at an additional cost of $2,400,000. His report added that Boulder power was economically unfeasible for San Diego unless the city engaged in the municipal distribution of electricity or sold its allotment to private interests.

More recently Mr. Eckart's figures were challenged by former Councilman Edward H. Dowell, who said that he was prepared to guarantee bids for building a power line to the dam at $6,000 per mile, $4,000 less than the Eckart estimate, and for installing a standby plant at a cost of $1,500,000. As the matter now stands the city's hydraulic engineer, H. N. Savage, has been instructed to negotiate with the Metropolitan Water District of Southern California to determine whether the district would transmit the city's allotment over its lines.

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Oklahoma Utilities Not to Oppose Merchandising Law

EVERY UTILITY COMPANY in Oklahoma will without contest observe the law, effective July 11, prohibiting such companies from selling electrical merchandise. Announcement of this stand is made by E. F. McKay, manager of the Oklahoma Utilities Association, who said that the policy of no contest is to be followed although several attorneys have expressed the opinion that the law is unconstitutional.

Utility companies are now preparing to dispose of their present stocks of merchandise. They are permitted to sell what they have on hand even after the law becomes effective. Promotional departments of some of the larger power companies will continue educational activities to promote the sale of the best electrical equipment. Some may offer the services of trained appliance experts to merchants, it is reported.

In Kansas some public utilities are discussing a suit to test the anti-merchandising law passed in that state. There are two legal questions involved. One is whether the state by legislation can abrogate a provision of the charter of a corporation. The other is whether or not the state can prohibit any one going into the merchandising business who wants to do it, whether person or corporation, so long as the business is legitimate. Some of the utilities, it is reported, however, have already determined to organize separate corporations to handle their appliance business. At least one of the largest light and power companies in the state has determined that it will not oppose the law, even though the latter is so drawn as to prevent the sale of a fuse or anything whatever except electricity.

Oklahoma and Kansas are the only two states where anti-merchandising bills have been passed. Defeated or not reached on the calendar in Nebraska, Nevada, Missouri, Indiana, Pennsylvania, California and Texas, such bills still pend in Illinois, Tennessee, Wisconsin and Alabama.

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Transmission Problems to Be Canvassed at Paris

THE SIXTH biennial session of the International Conference on Large Electric High-Tension Systems will be held in Paris, as already announced, on June 18-27. Five hundred and twenty-five engineers, representing 21 countries, are already registered, and the total attendance may be higher than in 1929, when it was 703. One hundred papers will be grouped in three two-day sections to cover steam and water-power station lay-out, overhead and underground transmission-line design and insulation, operation of networks and interconnection. Special attention will be given to transformer oils, circuit breakers, "dancing" conductors, insulator research and specifications and protection against lightning. After the session three tours will be organized—to the Massif Central, the Pyrenees, and Alsace respectively. Tribot Laspière, 54 Avenue Marceau, Paris, is the director and secretary of the conference.

Scattered Happenings in the Electrical Sphere

UNITED STATES

Permit for Lower Tennessee Plant

A preliminary permit has been issued by the Federal Power Commission to Southern Industries & Utilities, Inc., for a power project on the Lower Tennessee River covering the stetch between Pickwick Landing, near the southern boundary of Tennessee, and a point about 20 miles above the mouth of the river. The total length of the pool is estimated to be 190 miles. The commission is of the opinion that the project will fit into the comprehensive scheme for improvement of the Tennessee worked out by army engineers and involving navigation, power and flood control. Primary horsepower is estimated at 94,000 and ultimate cost of the dam and navigation facilities at $46,000,000.

Vermont Electrical Men Meet

The Vermont Electrical Association met May 22 at Lyndonville, Vt., for business, an inspection trip and a banquet. These officers were elected: President, L. A. Bill of St. Johnsbury; vice-presidents, William Wallet of Proctor, J. W. Sheehy of Burlington and Hugo Rocktaschel of Worcester, Mass.; secretary-treasurer, C. M. Jennings, Burlington.

Six Colorado River States to Confer

At the invitation of the Secretary of the Interior, representatives of Arizona, Colorado, Wyoming, Utah, New Mexico and Nevada will meet at Denver June 9 to formulate plans for a survey of the Colorado River watershed in connection with reclamation and further development of hydro-electric power. California was not included in the conference because a similar survey has been made there.

Arizona to Make Another Move

A suit calling upon the United States Supreme Court to make an "equitable apportionment of the waters of the Colorado River" is now recommended by Arizona's past and present Colorado River commissioners, by Governor George W. P. Hunt and by other state officials summoned by the Governor to discuss the Supreme Court's dismissal of Arizona's suit to test the constitutionality of the Boulder Canyon act.

Oregon Commissioner Begins Rate Cases

The Eastern Oregon Light & Power Company has been summoned to appear before the Public Utilities Commissioner of Oregon and give testimony pertinent to its rates and charges. This is the first of a series of hearings in the state-wide probe of utility rates ordered by the Oregon Commissioner. The investigations involve the operations of all major electric utilities in the state.

Federal Power Chairman Files Answer

An answer to the suit instituted by the Senate to oust George Otis Smith from the chairmanship of the Federal Power Commission was filed in the Supreme Court of the District of Columbia May 23. George Wharton Pepper appeared as attorney for Mr. Smith.

Brawley Defeats Municipal Project

An intensive nine-day election campaign at Brawley, Calif., over a "surprise" measure providing for the issue of bonds for an electric distribution system in anticipation of installing a Diesel-engine plant to compete with the Southern Sierras Power Company led on May 21 to the defeat of the project by 554 to 385.

Utility Advertising Men to Convene

Various phases of utility advertising will be covered in seven or more addresses by utility executives, specialists and newspaper men at the meeting of the Public Utilities Advertising Association to be held in New York on June 16 and 17 in connection with the annual convention of the Advertising Federation of America. J. S. S. Richardson is chairman of the program committee.

Petersburg-Roanoke Rapids Line Goes In

Completion by the Stone & Webster Engineering Corporation of the 115-kv., 56-mile transmission line between Petersburg, Va., and Roanoke Rapids, N. C., at a cost of $750,000, is announced by the Virginia Electric & Power Company. It forms the third side of a triangular system from the hydro-electric plants at Roanoke Rapids, one previous line extending east to Suffolk and another northwest from Suffolk to Petersburg. Other lines run north from Petersburg through Richmond to Fredericksburg and south into North Carolina territory from Roanoke Rapids. The new line permits exchange of power with the Virginia Public Service Company and the Carolina Power & Light Company.

Engineering Monographs to Be Issued

The Engineering Societies Library announces completion of arrangements for publication of a series of technical treatises to be known as "Engineering Societies Monographs." Editorial supervision will be in the hands of a committee of which Harrison W. Craver, director of the Engineering Societies Library, 29 West Thirty-ninth Street, New York, is chairman, aided by two representatives of each of the four major national engineering societies. The aim is to make promptly accessible to many users information which otherwise would be long delayed in reaching more than a few.

Commonwealth Edison Helps Chicago Out

Money due late in June from the Commonwealth Edison Company to the city of Chicago under the franchise ordinance was advanced by that company at the end of May to the amount of $2,000,000. This action enabled the city, which is in a temporary financial tangle, to pay overdue salaries to city employees for the first half of May.

Jamestown, N. Y., to Enlarge Plant

Unless forbidden by the Public Service Commission, the city of Jamestown, N. Y., will purchase all the electric distributing system of the Niagara, Lockport & Ontario Power Company within its boundaries and in certain neighboring territory for $750,000. The city will buy about 1,000,000 kw.-hr. annually from the company.

CANADA

Shawinigan Construction Goes On

Release of 33,000 additional horsepower at the La Gabelle unit of the Shawinigan Water & Power Company recently, bringing the company's total deevloped power resources to 863,000 hp., is looked upon as an indication that it is experiencing no extraordinary decline in demand for power. Company officials say that there is no intention of a let-up in the expansion program.

ABROAD

Rapid Progress of British Scheme

A RECENT REVIEW of the accomplishments of the Central Electricity Board says that in about three and a half years it has constructed more than 1,000 miles of overhead transmission lines operating at 132 kv. and 66 kv. and has obtained rights-of-way for a total mileage of 2,300. In another twelve months, says the review, it will have completed all the preliminary work of surveying transmission routes and "obtaining wayleaves for construction of the pylons."

Coming Meetings

National Electric Light Association—Atlantic City, June 8-12. A. J. Marshall, 420 Lexington Ave., New York.

Public Utilities Advertising Association—New York, June 14-16. Room 1748, 4 Irving Place, New York.

Association of Iron and Steel Electrical Engineers—Cleveland, June 15-19, J. F. Kelly, Empire Bldg., Pittsburgh.

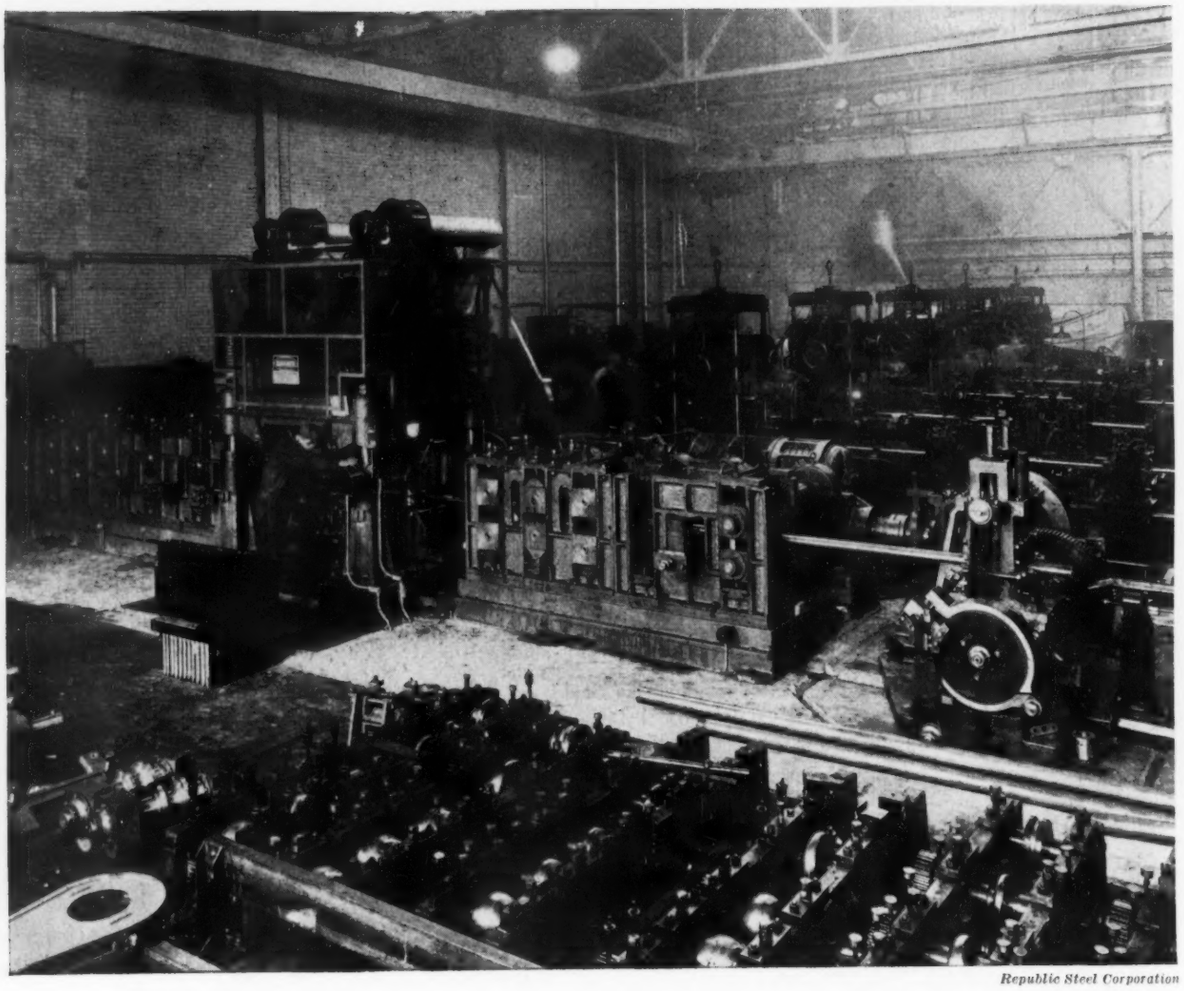
Illumination Conference—New York, June 15-17. Westinghouse Lighting Institute, 46th St. and Lexington Avenue.

Canadian Electrical Association—Banff Springs Hotel, Banff, Alberta, June 16-18. H. W. Lyster, 407 Power Bldg., Montreal.

American Institute of Electrical Engineers—Summer convention, Asheville, N. C., June 22-26; Pacific Coast Division, Lake Tahoe, Calif., Aug. 25-28. F. L. Hutchinson, 33 W. 39th St., New York.

Pacific Coast Section, N.E.L.A.—Del Monte, Calif., June 24-27. K. I. Dazey, 447 Sutter St., San Francisco.

Camp Co-operation XI—Association Island, Henderson Harbor, N. Y. July 27-31. Society for Electrical Development, 420 Lexington Avenue, New York.



Republic Steel Corporation

Welding tubing at 80 ft. per minute

Electric welding has solved another production problem. This machine, developed after several years of experiment, welds tubing up to 5 inches in diameter and $\frac{1}{4}$ inch in thickness.

Large coils of flat steel stock are fed into rolls to be formed cold into a tube. The latter passes directly under the electrodes, where fusion takes place.

Under 1,200 kw. of electrical power concentrated continuously in a spot no larger than a lead pencil eraser the job is done.

Testing is continuous. The weld is virtually imperceptible. Tolerances of 0.004 to 0.008 inches plus or minus are observed.

EDITORIALS

L. W. W. MORROW
Editor

Manufacturers hold firm

AT THE recent meeting of the National Electrical Manufacturers' Association at Hot Springs there was little evidence of pessimism or business demoralization. On the contrary, while business was admittedly far below normal, most of the manufacturers were looking forward to better times and were making individual and co-operative plans to improve their business and business practice. There was a very high morale and a very decided desire to stabilize and advance business standards.

This meeting marked a milestone in that attention turned from internal problems in engineering standardization and factory production to problems in distribution and marketing. A keen realization existed that a study of electrical markets should be made, that there should be a study to determine the best and most economical distribution channel to reach the markets, that individual self-control and stability can be had only by the institution of group efforts to get information and produce customer acceptance of products. Two or three sections started to work on plans to stabilize and advance business in their special products, and a general feeling was prevalent that the N.E.M.A. could embark upon a broader and more helpful program than ever before.

It is encouraging to find this intelligent and frank attitude upon the part of electrical manufacturers. The industry needs their products and the initiative and research on which these products, so essential in the sale of electrification to the country, rest. Despite the business depression, the manufacturers are going ahead. They are maintaining price courage and business courage. They are planning for more business and are doing what they can to prevent recurrence of the present depression. The Hot Springs meeting served to unite them and focus their attention on constructive work as never before. It proved the value of the trade association and showed the plucky spirit that animates electrical manufacturers.

Patent reversal heartens independent invention

WHAT the General Electric Company has called one of the greatest of the many great inventions which have originated in its famous laboratory has now been declared by our highest court to have been produced under a void patent. After a sequence of favorable and unfavorable rulings the conclusion finally reached is that Dr. Langmuir merely perfected De Forest's audion when he improved the vacuum and thus circumvented the ionization obstacles to superior tube performance.

Just what upsets will follow this weakening of the foundation on which the Radio Corporation of America has been erected cannot be predicted. There may be none. But one thing that has been established by the decision is a somewhat clearer line of demarcation between physical research and refinement on the one hand and technical inventive genius on the other hand. The implication in this instance seems to be that evacuation of gases is a matter of degree, and if electronic behavior alters progressively or even abruptly, that is a fortunate attendant circumstance accompanying perfection. It constitutes merely a natural development of the art by those skilled in it and therefore competent to apply the scientific results of experimentation and investigation.

Other recent decisions of the Supreme Court indicate a shift toward liberalism in interpretation, and in some respects this Langmuir reversal has that aspect. It gives freer rein to the inde-

pendent inventor and takes him one step further from the fear that organized research monopolizes invention through the greater facilities for enhancing refinement and prosecuting promptly all channels opened by a new discovery.

Utility merchandising survey shows the way

A SURVEY of utility merchandising showed that ninety-six utilities sold about $55,000,000 worth of appliances in 1930. The details of this survey are printed in the ELECTRICAL WORLD for May 30 and June 6.

What conclusions may be drawn? In general, it may be said that neither the utilities nor the appliance manufacturers have reason to congratulate themselves on the results as measured by market saturation or good merchandising. Yet no business is perfect, and, considering the factors involved, the results obtained are creditable and understandable. The chaos in policy and practice is to be expected, and the lack of a national plan for the distribution of goods, for increasing customer acceptance of products and for sale of appliances is an inevitable result of the growth of the appliance business.

But the time is ripe and the data are available to do a better job of merchandising and sales. The data and experiences recapitulated in the survey should be studied and capitalized. The national effort to create demand for and sell electric refrigerators is a sample of the thought and action that should be applied to every electrical product. And the sale of multiple products by one salesman must be developed to a greater extent. This involves a new method or changed method distribution of appliances and a much better paid and higher-grade field salesman. Each community needs to organize all sales outlets and distribution agencies to put common policies and practices into operation. Manufacturers of appliances need to change their national sales policies to get better sales through making selling more profitable. All need to consider the fostering of customer acceptance and demand as more important than reduction in first cost of appliances.

Undoubtedly better conditions can be brought about and will be brought about. But this cannot be done quickly or by individual effort. Each community, each trade association, each manufacturer will need to focus individual and cooperative effort toward the one goal—appliances to households in maximum volume at the most economical price. Enough action is now under way to indicate that results will ensue in a comparatively short time. Now as in the past the electrical industry will grasp the business opportunity and remove the handicaps that the survey shows.

Untrammeled viewpoints aid solution of problems

HERE and there a new spirit is arising which gives more promise than ever before that the solution of vital problems before the industry will be found. It has displayed itself in New England, New York and more recently in Missouri—possibly elsewhere. That new spirit which augurs better days is the invitation by regional or district utility organizations to all speakers to express their opinions freely whether they agree with present practice or not.

In New England on two occasions a woman speaker—Sarah Harding Hunter—was invited to report on her analysis of why some domestic electrical devices are not sold so extensively as they should be. She told some facts that may have hurt individual sensibilities, but they pointed the way toward removal of those obstacles. In New York Dean William E. Mosher called on utility companies to adopt a code of ethics and assure its enforcement. In Missouri M. R. Stahl, chairman of the State Public Service Commission, was invited to unfold his opinions regarding the cause of political agitation against utilities and methods of avoiding it.

When every business realizes that its major troubles are usually caused by failure to consider outside viewpoints, when platitudinous speeches are banned, and when constructive criticisms are eagerly sought and the things rightly condemned are remedied, many problems that now trouble industry will melt away like a fog. Either the audience will recognize its mistakes and correct them or the conscientious critics will be convinced that their unfavorable comments are based on

error. This is essential to mutual understanding and harmony.

As such a spirit becomes more universal individuals and companies may recognize the wisdom of subordinating individual interests and accepting or even demanding national leadership of national trade and industrial organizations. In this way relief from the shackles that now hamper constructive work so greatly may be gained.

Release the "instrument engineer"

THERE is a new profession growing up in American industry. In the lack of a more fitting designation its practitioners are now known as "instrument engineers." At present each "instrument engineer" stands pretty much by himself, set off from his fellows by the peculiar conditions of his particular industry or perhaps even of his particular place of employment. Yet there is a direct liaison between all of the men working in this rapidly developing field. Even though it may seem that there can be little similarity in the work of production control in a tire factory and in a food-products plant or in a steel mill, such similarity does exist—more so than is superficially apparent.

In the first place, almost all schemes of control and supervision are based on the use of electricity as an indicator and as the agent responsive to conditions. Second, these schemes employ instruments and devices common to all—all kinds of meters, time devices, and so forth — that in various combinations perform functions individual to an industry or to a plant process. Third, every "instrument engineer" must be by temperament blood brother almost to every one of his fellows, for the characteristic of inventiveness and the instinct for the short cut are inherent in all of them.

The new profession is still fettered by the shackles laid on it by competition between industrial firms in the same field. When a smart lad in one plant assembles a few meters and relays into a sort of Goldberg hook-up and demonstrates that this collection of gadgets will actually improve production, the factory executive is loath indeed to tell the world about it. He wants to retain the competitive advantage he thinks he has. It does not occur to him that his competitors also have a few smart lads who, very probably, are also devising means and methods to cut production corners. The competitors also feel that they want to keep these things to themselves, and they also are obtuse. The result is that progress is held up and production economies do not spread through industry as rapidly as they should for the best good of all. It is time for the "instrument engineer" to find himself a better name, to insist on the dignity of his profession and to establish such value for the service rendered as will bring his work into the recognition that follows wide utilization.

Factory-built substations

NOT many years ago every substation built provided a special task in engineering and construction. Now the trend is toward factory-built standard assemblies of the equipment necessary to a complete substation. In the outdoor high-tension field the use of factory-cut or factory-built steel structures is common and a further advantage in the standardization of the breaker, transformer, "disconnect," instrument transformer and other equipment necessary to step-up or step-down stations.

Low-voltage networks served to start a similar trend toward factory-built substations, and this was helped by the use of welded sheet-steel-inclosed assemblies. It is now possible to buy a metal-clad substation unit for an underground or overhead installation that is completely factory-built for voltages up to 66,000.

It seems reasonable to extend the work done on standard voltages, standard breakers, standard transformers and so forth into standard substation assemblies for each voltage level. If these can be factory-built, the economies of mass production, reductions in installation cost and decreased obsolescence in service installation will be realized.

Substations are functional assemblies, and individual ideas of design and installation should be subordinated to the cost reductions possible in national standardization and mass production in factories where facilities are available to do work most economically. There is much to be gained by making a thorough study of the possibilities that lie in this field.

Pipe Line Pumping Needs Electric Service—Now!

Largest single market for electric power at present apparent.

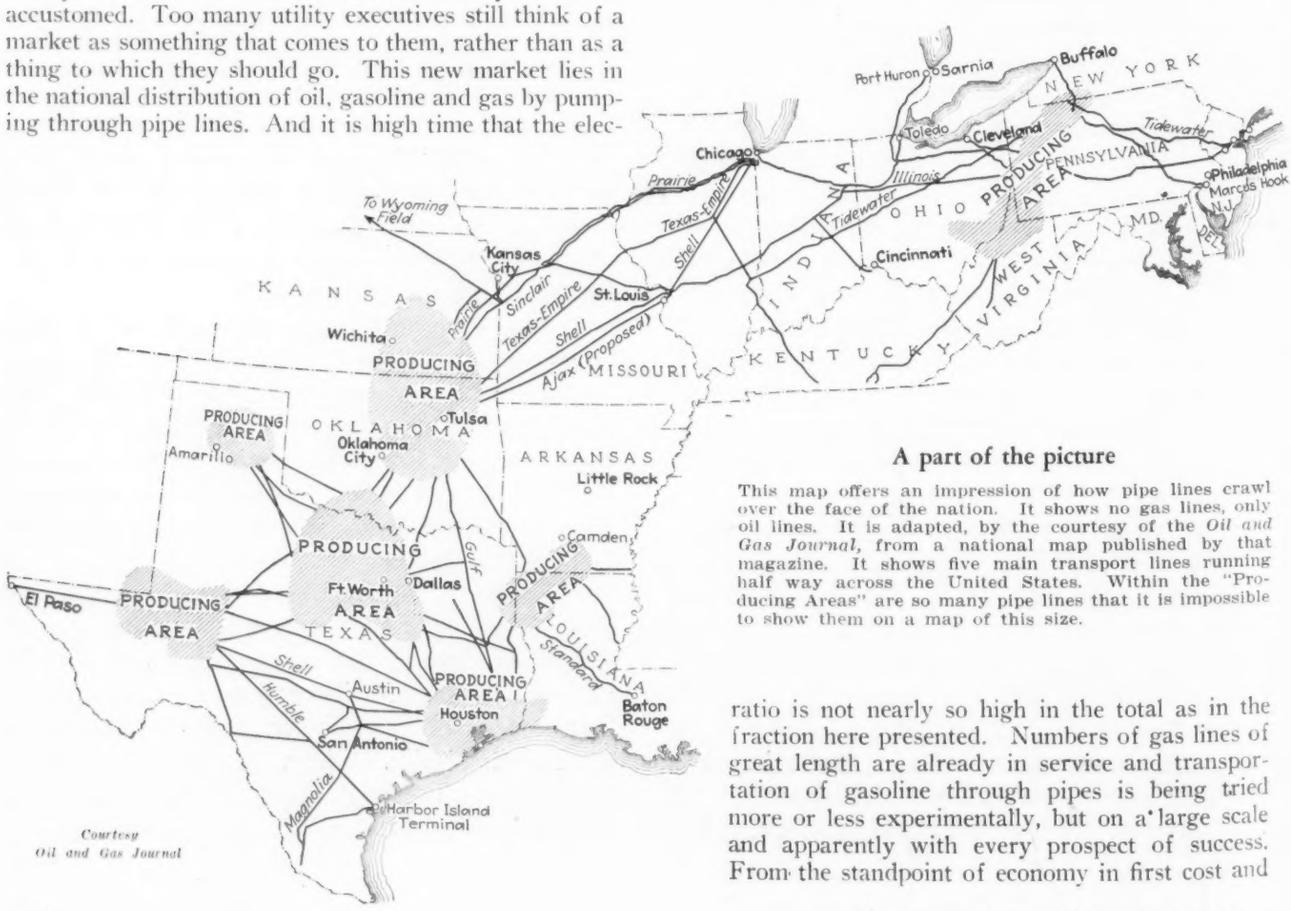
Central-station service not attractive to pipe line operators because of diversities in rate forms.

Uniformity of utility rate and contract forms the crying need.

A POTENTIAL market that, properly developed, will pay at least $10,000,000 per year in the near future and ultimately ten times as much for electric service is going begging. The reason is that some of the central stations that might supply this demand apparently cannot recognize a commercial opportunity in any other form than the one to which they have been accustomed. Too many utility executives still think of a market as something that comes to them, rather than as a thing to which they should go. This new market lies in the national distribution of oil, gasoline and gas by pumping through pipe lines. And it is high time that the electric utilities of the country wake up to it and give it the concerted attention it needs.

Pipe lines are not confined to a few states and their potentialities as electricity consumers should interest at least two-thirds of the central stations in the country. The market exists right now in practically all except the mountain and northwest prairie states. It exists in zones radiating from the southwest oil fields northeast to the Great Lakes region and eastward to the Atlantic seaboard through Kentucky, Tennessee and Alabama. Also the California oil fields extend their lines northward along the Pacific Coast.

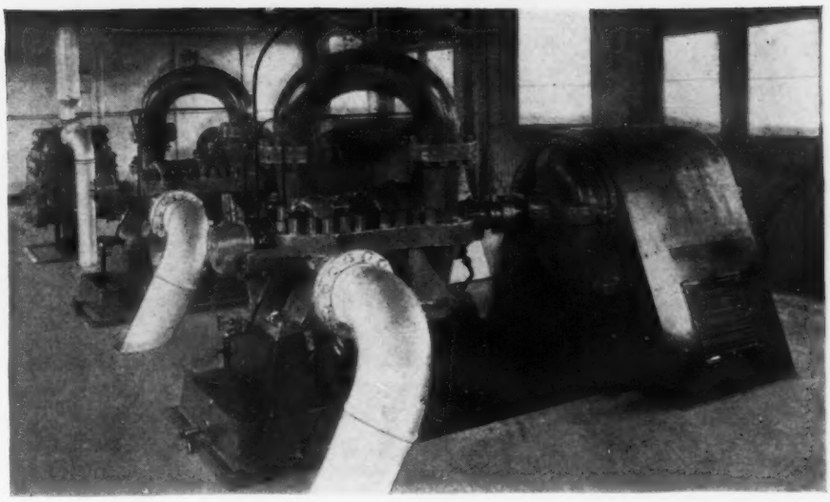
Pipe lines are being extended so fast that a figure of total mileage quoted today will be considerably in error tomorrow. The accompanying table shows some of the recently constructed lines and gives an idea of the extent of their electrification. The total mileage in the United States is now close to 100,000, but the electrification ratio is not nearly so high in the total as in the fraction here presented. Numbers of gas lines of great length are already in service and transportation of gasoline through pipes is being tried more or less experimentally, but on a large scale and apparently with every prospect of success. From the standpoint of economy in first cost and



Courtesy
Oil and Gas Journal

A part of the picture

This map offers an impression of how pipe lines crawl over the face of the nation. It shows no gas lines, only oil lines. It is adapted, by the courtesy of the *Oil and Gas Journal*, from a national map published by that magazine. It shows five main transport lines running half way across the United States. Within the "Producing Areas" are so many pipe lines that it is impossible to show them on a map of this size.



Simplicity of electric pumping

This is the Oklahoma City station of the Sinclair-Texas Pipe Line Company. The motors are 500 hp., 2,200 volt, 3,500 r.p.m., induction type. The centrifugal pumps are operated in series, one 320 lb. and the other 280 lb., to give a total pressure of 600 and to handle 60,000 bbl. of oil per day.

in operation electric drive is best adapted to centrifugal pumping, and this is perfectly suitable in any oil pipe line. For gas transportation the centrifugal pump is not considered, although a new development now under test may change the aspect of this situation radically. For gasoline lines the reciprocating pump is favored by operators, although centrifugal pumps are in some use now and probably will soon find wider acceptance.

But whatever the type of pumping equipment, electric drive can prove its economy and worth if it is properly sold to the oil industry. The reward to the central stations for such selling effort can be measured by basing an estimate of gross income on the 14,000 miles of oil pipe line shown in the table. Pumping stations are spaced at an average distance of 40 miles apart. Each station represents, say, 900 hp. The load factor would be about 70 per cent. Taking a rate of 1 cent per kilowatt-hour, a few passes on a slide rule indicate an annual gross income of more than fourteen million dollars. This is for pumping oil only. Add several more millions for gas and gasoline transportation to arrive at the value of the market represented by only recent construction.

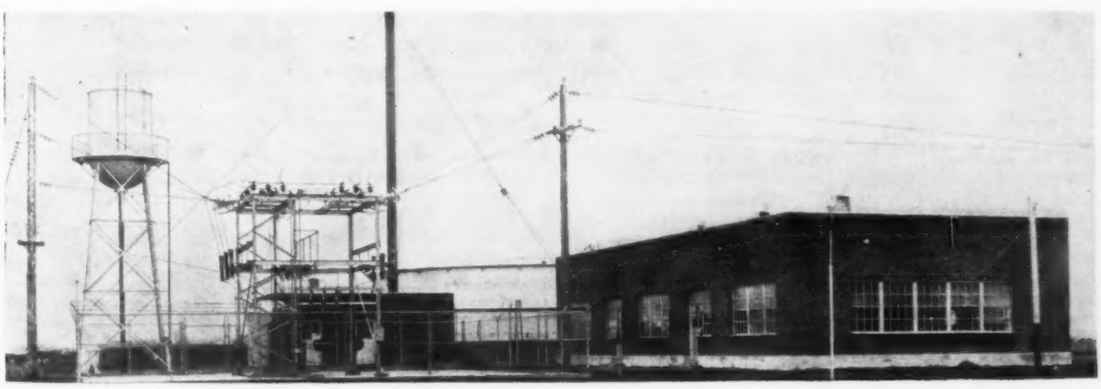
On about three-quarters of the 14,000 miles of oil lines shown in the table other motive powers than electricity are used. Thus there is little immediate prospect of greatly increasing the utilities' share of the fourteen million dollars annually calculated in the preceding paragraph. But if the electric utilities are on the job, as they will be if the opportunity is recognized, they can show the oil industry the economy of electric operation on all new lines. Just a cursory study of recent issues of petroleum and gas periodicals indicates that pipe lines were built at an astounding rate during 1930. Estimates range from 3,000 to 5,000 miles for the year. Here is business that can and should be secured. And eventually the older lines can be converted to electric drive as the factors of obsolescence, repairs and maintenance loom larger in annual costs. Remote control of electric drives offers remarkable promise of labor saving in operating attendance at pumping stations and the low rate of depreciation, infrequent repairs and small maintenance of electric equipment, coupled with the fact that the cost of electric power is continuously decreasing, can be shown to offset any claimed advantages of other motive powers.

A start has been made

What has been done so far in the development of this, the largest single market for electricity immediately apparent? Comparatively speaking, very little has been done, but in actual terms and considering handicaps a great deal has been accomplished. The oil industry as a whole, including production, refining and transportation, is less than 10 per cent electrified. It is probable that the growth of electrification in the first two divisions will be slow unless radically new methods and processes are introduced. But they do not concern

Nearly a thousand miles from the oil field

At Fairbury, Ill., is located this station of the Texas Empire Pipe Line Company. Service is from the Public Service Company of Northern Illinois. Energy is sold at 2,300 volts on the secondary side of the outdoor substation, which is owned by the utility. Incoming voltage is 33 kv., stepped down in three 333-kva. transformers.



us here; it is the third, transportation, that affects the greatest number of central stations and that must be dealt with immediately.

A recent survey of seventeen pipe lines shows 235,110 hp. of pumping capacity installed. Of this capacity 65,000 hp., or about one-quarter, is electric. This indicates, apparently, that the central stations have not done so badly so far. But the indication is only apparent, for the greatest number of electrically operated stations is in the service territories of only a very few central stations. The indication is that some of these few utilities have some executives and power salesmen that have done a good job against strong competition, not that the central stations as a group have done very much.

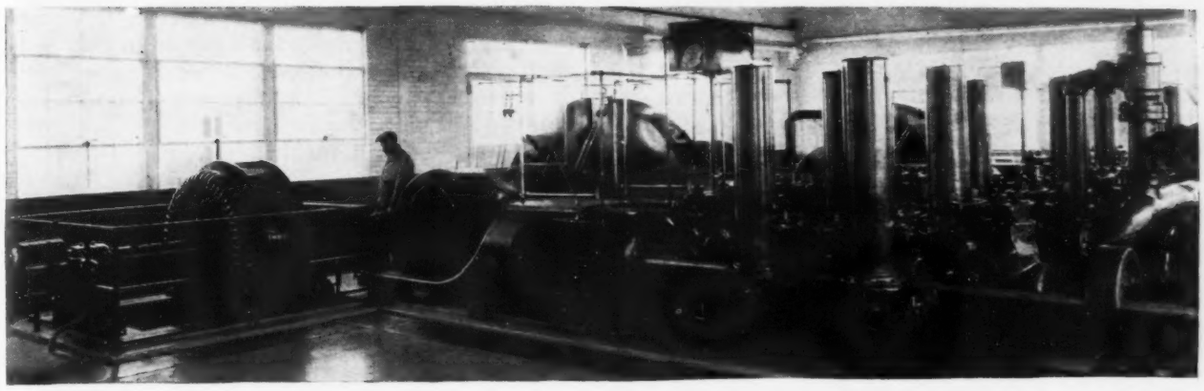
In other directions than actual signing of contracts quite a few things have been done. There has been a rapid development of centrifugal pump design by manufacturers to adapt these units more definitely to pipe line pumping requirements. Experimental work initiated by the Tulsa section of the American Society of Mechanical Engineers, in co-operation with members of the American Petroleum Institute, resulted in the showing at the Petroleum Show in Tulsa last year of a completely automatic pumping station. From this experimentation and from the tendency of development it expressed has come an automatic station equipped with supervisory control now in service at Sand Springs, Okla. Electric drive is in a much more advanced stage for application to pipe line pumping than it was at the beginning of any other industrial use.

By co-operative work of some pipe line and utility companies there have been made a number of authoritative and detailed studies of costs and performances of electrically operated pumping stations. These data, while they have not been as widely disseminated as is desirable, are available to any interested persons who seek them out. The particular economic advantages of electric drive as revealed by these studies are sharp reductions in investment and operating labor costs. The only comparative advantage of other forms of power is low fuel cost as against the electricity bill. This claim loses much of validity when proper accounting takes cognizance of charges for handling and transporting oil and gas fuel, even though the fuel may be the transported oil itself or at its point of first availability may cost nothing or be a waste product.

Another constructive step is recognized in the organization of a sub-committee of the general power committee of the Commercial National Section, N.E.L.A., of which W. H. Stueve, Oklahoma Gas & Electric Company, is chairman. A parallel activity, but not covering quite the same ground, is the Public Utilities Power Conference as Applied to the Petroleum Industry. This group, which was organized in October, 1930, under the chairmanship of O. A. Jennings, also of the Oklahoma Gas & Electric Company, had a meeting in Tulsa last January at which some ideas, which will be treated later in this article, were brought forth. So far as organization for the job is concerned there is little more to be done. What is needed now is executive under-

Pipe Lines of Recent Construction

Company	Miles of Pipe	Size, In.	Capacity Bbl. per Day	No. Stations	Hp. per Station Prime Mover Elec.	Oil	Steam	Hp.
Atlantic P.L. Co.								
Midland-Pt. Arthur	480	10	30,000	8	600	....	....	4,800
Ajax P.L. Co.								
Tulsa-Wood River	360	2–10	65,000	7	...	1,000	....	7,000
Great Lakes P.L. Co.								
Okmulgee-Barnsdall	60	6	14,000	1	...	280	....	280
Barnsdall-Des Moines	350	8	28,000	7	...	560	....	3,920
Ponca Cy-Barnsdall	60	6	14,000	1	...	280	....	280
Des Moines-Chicago	300	6	14,000	6	...	280	....	1,680
Des Moines-St. Paul	220	4	6,000	4	...	100	....	400
Gulf P. & L. Co.								
Okmulgee-Houston	450	8	20,000	9	...	400	....	3,600
Tulsa to Muncie	630	10	35,000	13	...	500	....	5,800
Midland to South ML	370	8	20,000	7	...	400	....	2,800
Humble P.L. Co.								
Kemper to H.I. Gulf	330	10	35,000	6	...	600	....	3,600
Kemper to Comyer-Gulf	420	8	20,000	7	...	400	....	2,800
Panhandle-Comyer	300	8	20,000	8	...	400	....	3,200
Illinois P.L. Co.								
Yates to Lytell via Del Rio	230	8	20,000	7	300	....	....	2,100
Wood River-Negley	500	2–8	40,000	3	600	....	....	1,800
				7	...	600	....	4,200
Oklahoma P. & L. Co.								
Drumwright-DeQueen	215	3–8	60,000	2	...	900	....	1,800
	Standby electric			2	600	....	....	....
					700	....	....	1,300
Hewitt-DeQueen	165	8	20,000	5	...	300	....	1,500
Boosters inserted cap. 30,000 day	...	..	10,000	5	300	....	....	1,500
Drumwright-Hewitt via Seminole	120	8	20,000	3	...	300	....	900
Prairie P.L. Co.								
Drumwright-Whiting	630	8–8	200,000	10	...	2,400	....	24,000
				4	...	....	2,400	9,600
Carrolton-Wood River	185	2–8	30,000	4	...	400	....	1,600
Panhandle-Healdton	225	8	20,000	6	...	300	....	1,800
Healdton-Port Arthur	390	8	18,000	8	...	300	....	2,400
Healdton via Seminole Drumwright	180	2–8	30,000	5	...	500	....	2,500
Pure Oil P.L. Co.								
Van-Port Arthur	210	10	30,000	5	500	....	....	2,500
Shell P.L. Co.								
McCamey-Houston	450	10	30,000	9	500	....	....	4,500
McCamey-Cushing	485	10	40,000	14	800	....	....	11,200
Cushing-Wood River	400	2-10	60,000	10	...	1,000	....	10,000
Wood River-E. Chicago	220	8	18,000	5	...	300	....	1,500
Stanolind P.L. Co.								
Drumwright-E. Chicago	630	10	80,000	16	...	1,200	....	19,200
		10	.....	2	...	1,200	....	2,400
Okla. Cy-Drumwright via Seminole	100	8	50,000	2	1,200	....	....	2,400
Drumwright-Houston via Healdton	510	2–8	30,000	11	...	450	....	4,950
Wyoming-Kansas City	...	..	.....	out	...	....	....	....
Sinclair-Tex. P.L. Co.								
Okla. City-Coffeyville								
Only 40,000 cap. now with 2 stat'ns	165	12	60,000	4	1,000	....	....	4,000
Proposed to continue to Chicago and tidewater 20?								
Texas-Empire P.L. Co.								
Cushing-Chicago	580	12	50,000	10	...	900	....	9,000
Boosters to increase to	...	..	.....	9	...	800	....	7,200
75,000 bbl.	...	..	.....	9	1,600	....	....	14,400
Seminole-Cushing	50	10	40,000	2	400	....	....	....
					800	....	....	1,200
Phillips P.L. Co.								
Panhandle-St. L. via K.C.	690	8	25,000	15	...	500	....	7,500
Texas P.L. Co.								
Henryetta-Houston	410	2–8	20,000	4	...	400	....	1,600
				6	...	600	....	3,600
Incr'ses at Sherman Yates-Houston	390	10	40,000	5	...	800	....	4,000
via Camey	...	..	.....	4	800	....	....	3,200
Panhandle-Ft. Worth	290	8	20,000	8	...	300	....	2,400
Magnolia P.L. Co.								
Eldorado-Port Arthur	240	8	20,000	8	...	300	....	2,400
Midland-Port Arthur via Ft. Worth	540	2–8	40,000	6	...	600	....	3,600
				6	600	....	....	3,600
Seminole-Burk Burnett via Duncan	150	2–8	35,000	4	...	600	....	2,400
				3	500	....	....	1,500
Sun P.L. Co.								
Bayonne-Toledo "Gasoline"	450	8	25,000	10	500	....	....	5,000



Motor drive on reciprocating pumps

In the Fairbury station of the Texas Empire Pipe Line Company are three 700-lb. reciprocating pumps capable of moving 74,000 bbl. of oil per day. There are three units, two 30,000 bbl. and one 14,000 bbl. The latter, not shown in the picture, is driven by a 200-hp., 2,300-volt, 585-r.p.m. induction motor. The two others are powered by synchronous motors of 450 hp. each at 2,300 volts and 450 r.p.m. The pump speeds are 45 r.p.m. on the two larger units.

standing and interest behind these organizations to make them effective.

There are two matters on which central stations must take concerted action before pipe line load can become the major electrical customer it should be. The more important of these has to do with rate schedules. A pipe line is a single operating unit. It may, and frequently does, traverse the service territories of a number of utilities. The pipe line owner cannot reasonably be asked to break up into numerous operating and accounting parts the line that in his business is a single unit. He objects violently to suggestions that he do so and would much rather pump with oil or gas engines than bother with the complication of rate schedules and service rules offered by the different central stations from which he might buy energy. To him a kilowatt-hour is a kilowatt-hour. He sees readily that it may cost more or less in one place than another and he is quite willing to admit and accept that necessity. But he cannot understand—and neither can any one else—why, for instance, one utility must calculate demand on a fifteen-minute interval while its neighbor insists on a half hour or takes demand as a proportion of connected load. So long as these diverse conditions obtain it is practically impossible for the pipe line operator to buy electricity and reach any common denominator of energy cost for the whole line.

A study of the rate schedules* and service rules of about fifty power companies that should be interested in pipe line pumping was presented at the Tulsa conference earlier referred to. It showed an amazing and a really quite ridiculous diversity of methods for determining demand, of consumption blocks or steps, of discounts and of service rules. One cannot blame the pipe line companies for shying away from an imbroglio. It is not alone to pipe line business that these invidious remarks on electric rates apply, but also to railroads, packing companies and all other industries whose operations are national in scope. It is time for the central stations to investigate and simplify the national aspect of their rate schedules and the desire for pipe line load should be an excellent inspiration to the job.

The least important of the two objections to electric pumping in the mind of the pipe line operator is the diversity of service conditions that are offered him. In the interests of economy in purchasing equipment and of uniformity of installations, he would like to buy energy from all central stations along his line at the same voltage and the same type of transformer connection. One company offers him one voltage with ungrounded delta set-up and another a different potential with grounded star. These differences, while they need not affect motor and control equipment, do require variations of design of transformer, switching and protective installations that are costly. But the utilities have been wrestling with these standardizations for years on their own account. Progress has been slow and it is not likely that it will be greatly hurried by consideration of any one particular class of business.

Of the two matters, that of rate schedules is by far the greatest stumbling block in the way of extensive application of purchased power to pipe line pumping. If that can be cleaned up quickly the job will be pretty well licked and differences in service conditions, while they will remain as a bar to highest economy, will not be an obstacle impossible to surmount.

Delayed proposals lose business

The necessity for concerted action by the electric utilities as an industry to get themselves into position for large-scale action—that is, by reaching agreement among themselves for uniformity of rate structures and service rules—is urgent. Urgent also is the necessity for immediate action on the part of any one central station or group of central stations if electric power is to be used on any new pipe line. First of all, the instant a projected pipe line is heard about a utility representative who has authority to act must immediately get into touch with the responsible executive of the project. He should not quibble with himself over the cost of long-distance telephone calls or hesitate to hop an airplane. The oil man works fast. If a new field line is projected to gather oil from a strike a day's delay may mean the loss of millions of barrels of oil or large damage suits following the opening of a gusher. The oil people think nothing of laying down several miles of pipe line within a few hours after the first demand for it. The same spirit of "it must be done right now," that characterizes field operations, is carried over into the construction of

*See "Electrical World," May 9, 1931, page 867.

pipe lines of greater length, even transcontinental ones. To get the business the central stations must act with equal speed.

When a line is to be run through the territories of eight or ten utilities the pipe line engineers cannot sit down and leisurely analyze an equal number of complex contracts to determine net costs per kilowatt-hour under different conditions of operation as they affect power factor, demand, load factor, etc. The utility representative should have at his hand graphical analyses of the different rates so that instantly he can say what net costs will be under stated conditions. Also pipe line executives cannot delay decisions while they wait for estimates on line extensions, substations, pumping equipment and control. If the utility man has not a complete proposal at his tongue's tip he may expect to lose the business to the indefatigable oil engine salesman, who, you may be sure, is also right there on the job.

There are thus general and specific aspects to the pipe line pumping market for electricity. In the face of the first it behooves the central stations as a whole to take immediate steps toward a uniformity of power rate structures, such a uniformity as has long been desired and desirable in service to all industries of national scope. Not otherwise can the electric utilities hope for any considerable share of business from the country-wide expansion of pipe lines. In the specific aspect any central station or group of central stations wishing to sell energy to a projected pipe line must be willing and able to work at a speed equal to that of the pipe line builders themselves. In both aspects action is required, prompt, authoritative and decisive action, not tomorrow nor next week, but now, today, immediately.

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Laws Making Municipal Competition Easier

Only in New Hampshire, Connecticut and Florida are privately owned gas and electric properties protected by a statutory provision making it mandatory upon a municipality to purchase the private plant before constructing a municipally owned plant to compete. This fact, among many others, is revealed in a study of state constitutional and statutory provisions affecting municipal ownership of public utilities just published by the Institute for Economic Research at Northwestern University. The publication is in wall-chart form with citations of statutes through January 1, 1931, covering such provisions as the market area which the municipality may serve, the limitations as to bonded indebtedness, the procedure by which a municipality may engage in the public utility business, exemption from taxation, sale or lease of plants, and the degree of state regulation of municipal activities in this field.

While private capital has depended largely on the development of good public relations for indirect protection against municipal competition, it has often received such protection through the operation of the statutory debt limitations imposed upon municipalities. However, in certain states provisions for circumventing the restrictions of the debt limitation are nullifying this protection. For example, in Nebraska a law passed in 1921 governing metropolitan cities specifies that bonds issued to acquire or construct electric light and power plants or other utility plants are exempt from the debt limitation provision when a charge for the service is provided sufficient to pay the bonded obligations incurred. The initiated law passed at the general election of November 4, 1930, extends this exemption to all cities. Recent changes in the laws of this and other states are placing municipalities in a better legal position to compete with privately owned utilities.

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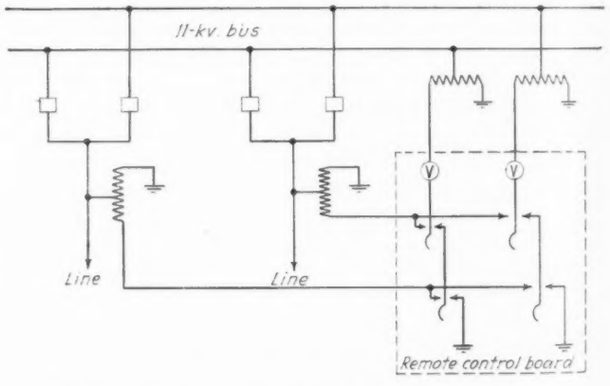
Synchronism Checked by Voltmeter

By F. M. LEWIS
Northwestern Electric Company, Portland, Ore.

Recently the Northwestern Electric Company completed a substation in the business district of Portland which will be remotely controlled until the station becomes large enough to require an operator. Some means of checking synchronism have to be provided as there were two sources of feed. To save the expense of installing additional control wires, synchroscopes, synchronizing switches or synchro-verifier relays, it was decided to use voltmeters to indicate the voltage of the two buses. As the remote control board consisted of telephone keys and indicating lamps to control the oil switches, an additional telephone key was added for each tie line as indicated in the accompanying diagram.



Voltmeter connection for checking synchronism between line and bus

By pressing this key the voltmeter is connected between the bus and line potential transformers. The transformers are so connected that if the voltmeter reads zero the line and bus are in synchronism, otherwise the needle fluctuates. It would have been preferable to have the voltmeter read double voltage to indicate synchronism, but this would have necessitated deviating from the company's standard connection for instrument transformers.

Heating-Element Deterioration Reduced in Cyanide Furnaces

By R. F. JAMES and GLENN COLEY
Research Department, the Detroit Edison Company

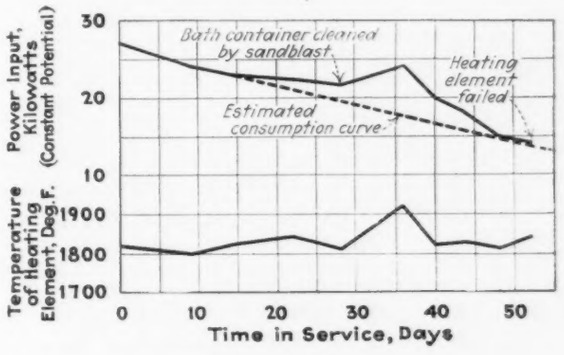
IN ALL examined cases of failure of heating elements in electrically heated cyanide pots used in steel hardening there appeared to be a progressive deterioration of the chrome-nickel elements. This deterioration was apparent from the development of "hot spots" and it terminated with the element burning through and opening the circuit. As a check on this deterioration, watt-hour meters were attached to a standard furnace in production service and periodic readings were taken. These readings showed a gradual drop in power consumption. This consequently necessitated a longer operating cycle to maintain the constant temperature in the furnace. In consideration of the decreased power consumption, it could only be deduced that the cross-sectional area of the elements was decreasing. By plotting the watt-hour meter readings and establishing the trend of the curve, it became possible to estimate closely the life of the element.

Investigation showed that, within the limits of economy, it was difficult to exclude cyanide or its components from the element or heating chamber. Molten cyanide dripping from the work as it was removed from the bath fell on the hot apron covering the furnace and leaked in through joints. Due to expansion and contraction in the circular pieces composing the top, it was practically impossible to make permanently tight seals. It was also found that molten cyanide or its components seeped through the metal of the bath container even though no flaws in the casting could be discerned. Examination of failed furnaces showed a "mossy" growth on the exterior walls of the container and deposits of what appeared to be cyanite on the floor of the element chamber under the container. Small piles of metallic scale were found around the elements.

From these indications it was evident that the element deterioration was associated with the presence of cyanide or its components. To determine the effects a piece of chrome-nickel wire was supported in a closed hood which covered a sand bath containing a crucible of molten sodium cyanide. The wire was heated by the passage of a current and watt-hour meter readings were taken. The set-up was run during the day and allowed to cool at night, thus simulating the work cycle of production furnaces. Plotting of readings showed the same type of curve as was obtained from the production furnace. A natural acceleration took place due to the increased concentration of cyanide. Typical deterioration did not occur when the wire was heated in air. It was also found that the rate of element deterioration in the presence of cyanide increased with an increase in element temperature. Approximately 1,650 deg. F. marked the economic maximum temperature.

From these field observations and laboratory experiments the following conclusions were drawn:

1. Cyanide or its components have a deleterious effect upon chrome-nickel alloys.



Power input decreases

These characteristic curves of power input and element temperature for a commercial cyanide pot indicate the progressive deterioration of the heating element.

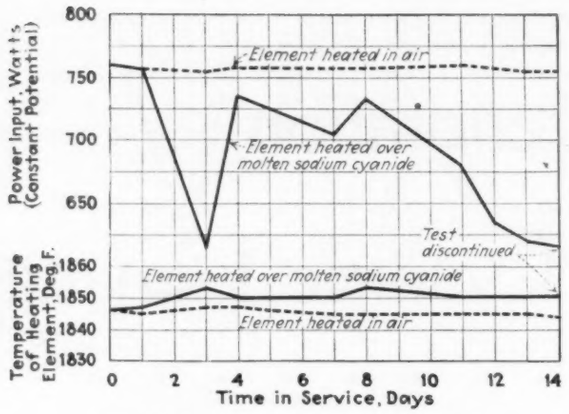
2. The reaction between cyanide and chrome-nickel alloys increases rapidly with an increase in temperature, and approximately 1,650 deg. F. is the maximum safe temperature for economic operation.

3. It is not economically practical to exclude cyanide or its components from the element chamber.

4. The deterioration of chrome-nickel heating elements heated in air is exceedingly slow (at temperatures below 1,800-2,000 deg. F.).

Based upon these conclusions a hypothesis was propounded to explain the deterioration of the heating elements:

> When cool, the heating elements are in a normal room atmosphere. As the furnace is brought up to temperature, the atmosphere in the element chamber gradually changes from normal to one containing cyanide or its components. This is due to the volatilization of the cyanide that has entered the element chamber by one of the ways previously discussed.
>
> The exact reaction of either sodium or potassium cyanide



Cyanide vapors attack chrome-nickel

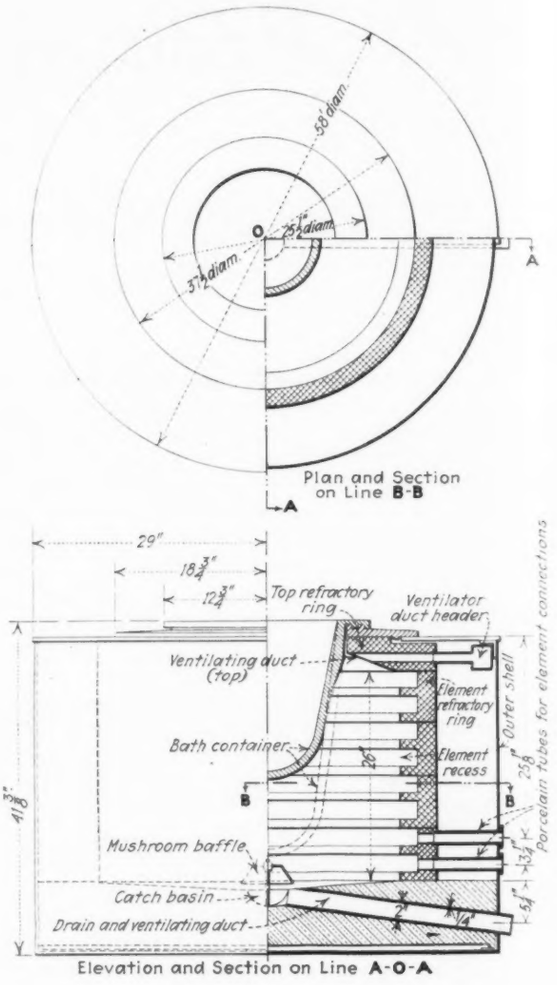
Laboratory observations of chrome-nickel wire heated over molten sodium cyanide and in air establish the fact of rapid cyanide corrosion.

with chrome-nickel cannot be definitely stated. Normally the cyanides when heated simply fuse, except when in the presence of air they take oxygen from the air and become relatively inactive cyanites. Both sodium and potassium cyanide are very powerful reducing agents and as such might attack the coating of protective oxide usually found on chrome-nickel elements. However, both of these cyanides readily form complex salts when heated with metals and it is probably these salts that are found around the elements in failed furnaces.

When the furnace is at heat, a condition exists where the concentration of cyanide is at a maximum and atmospheric air at a minimum. This lack of oxygen permits the cyanide to exist as such without the change to cyanite. At this period the elements are hottest and conditions are at optimum for rapid destructive reaction. The scale or dust caused by reduction of oxide is formed as a hard shell on the elements at this time. As the furnace cools down, the outside air enters the element chamber and tends to neutralize the chamber atmosphere by converting the cyanides to inactive cyanites. As the elements cool they contract and the partially reduced scale flakes off, leaving the virgin metal exposed to a repetition of the attack of alternate oxidation and reduction during the next heat. This cycle tends to decrease the cross-sectional area of the heating elements and constitutes the deterioration. On the strength of this hypothesis, it is evident that the maintenance of an oxidizing atmosphere in the element chamber at all times is essential to the preservation of the elements.

With these ideas in mind, an experimental furnace of an air circulation type was designed and built by the research laboratory of the Detroit Edison Company and placed in the plant of the Gemmer Manufacturing Company of Detroit for a life and production test. The furnace is pictured and described in the accompanying drawing. The service in the test was as severe as could be because of the heavy production required from the pots in the Gemmer plant. They are used for hardening steering gear sectors and a maximum production per hour is required.

The test pot as designed has an input of 43 kw. After a service of 1,800 work-hours a check of the element showed a power input of 42.5 kw., which is a considerable improvement over the power consumption curve shown by the earlier investigation. No scale was found around the elements, but the pot showed traces of leakage and a heavy deposit of what appeared to be cyanites was found on the floor of the element chamber. Electrical tests and physical examination showed no deterioration of the elements. On production this furnace consistently produced more than 4 lb. of work per kilowatt-hour without any covering of the pot. A full charge of work is delivered in eighteen to twenty minutes, which is well within the production speed desired on this work. An interesting feature of the furnace operation was the lack of appreciable quantities of the black sludge which usually forms on the surface of molten cyanide. It is believed that this sludge is a cyanite caused by the oxidation of the cyanides and is suppressed by the lower temperature differential and uniform heating of this type of pot.



The new type of pot

At the bottom of the element chamber is the discharge of the air inlet pipe. This opening is obstructed by a baffle so arranged as to assist natural convection in directing the air flow against the elements during the heating period and against the container during the cooling period. In this manner the element chamber, during the hot cycle, is swept with clean air at the critical points. To permit natural draft to accomplish the work just outlined, offtakes opening into the highest point of the combustion chamber are led off radially into a bustle pipe, which in turn goes to a vent discharging to outdoors above the roof. The amount of air passing through the combustion chamber is controlled by a damper in the vent pipe. This circulation of air accomplishes the dual purpose of oxidizing any fumes that get into the chamber and tends to maintain an even temperature due to turbulence.

The distance between the outside of the container wall and the heating element was increased over the standard practice in order to hold additional element capacity. This was done in order to lower the element temperature without decreasing the total heating capacity. This increase in the volume of the element chamber also tended to cut down the heat loss through the ventilating stack because of the lower thermal head obtained. The heavy wall insulation permits a greater degree of comfort to the operator. During operation with element temperatures at 1,600 deg. F. no great discomfort is felt when standing directly against the furnace exterior.

Automatic Control Improves Electrolytic Products

By F. A. BYLES
General Electric Company, Schenectady, N. Y.

ELECTROPLATING, one of the oldest of electrical processes, has taken a new spurt with the arrival of chromium plating. Zinc is being produced in huge quantities by electrolytic methods to a degree long dominant in the copper field. Deposition of non-metallic substances is a tempting possibility. All these processes are founded on definite quantitative relationship between current and rate of deposit. In many of them positive control of the current at the various stages is imperative if the product is to be uniform and acceptable. A discussion of the principles of control and their superiority is of immediate interest.

Modern production requiring the use of electrolytic processes, both from the cost and quality standpoints, demands that the work be carried on using known factors. The quantity and quality of a given metal deposit requires the close attention of those in charge of that process. This attention may consist of careful manual control or, as will be shown by this article, this work may well be delegated to an automatic regulator, which will not only bring about the desired results, without the constant attention of the workmen, but will do so much more accurately.

When an electric current is passed through an electrolyte consisting of a metallic salt solution, a quantity of metal is liberated proportional to the strength of the current and the time. For instance, let us consider a copper-sulphate solution, where copper enters as a monad with an electrochemical equivalent of 0.00065881 gram; a current of ten amperes for one hour will deposit approximately 23.717 grams. Now it is evident from Ohms law, current $= \frac{\text{Voltage}}{\text{Resistance}}$, that in order to assure the constant current necessary for a predetermined deposit, we must also have constant voltage and resistance. We usually can count on the resistance of a given electrolytic solution, with the necessary connecting wires and busbars being fairly constant, providing, of course, that the temperature factors remain reasonably fixed. Since the circumstances are those of constant current through constant resistance, constant voltage plays an important part in the electrochemical art.

Hand regulation has proved to be uneconomical and unreliable.

Electrodeposition is a calculable process, best accomplished under closely controlled electrical supply.

Manual control is inherently intermittent; graphic records often reveal this.

Operators have been known to produce perfect tabular records by adjusting the control devices just before taking readings. Automatic control surpasses manual control in this respect.

The usual electrolytic processes are in one of the two following groups:

1. Those requiring a number of containers of separate solutions, each requiring a different current value; all containers being connected in parallel to an electrolytic generator, having a voltage range to suit the system.

2. Those employing tanks or electrolytic units connected in series, the entire combination being connected to a generator of sufficient voltage to force the required current through the system.

These two groups usually require different kinds of generator regulators to bring about the desired current control.

In the first instance it is evident that a voltage regulator is the proper one to apply. This is because several different current values are usually required for the various tanks at the same time, which makes it impractical to apply a current regulator, unless a given process is of such importance as to warrant installing one for each tank. A voltage regulator so installed that it will hold constant busbar voltage allows individual current adjustments to be made by means of a rheostat in series with each tank circuit, with the assurance that when once made the current will remain constant for the desired period of time.

In the second instance a current regulator usually gives the most satisfactory results, because all the current passes through the entire group of units in series and only one current value has to be maintained at a given time, and which, if held constant, will produce the desired results.

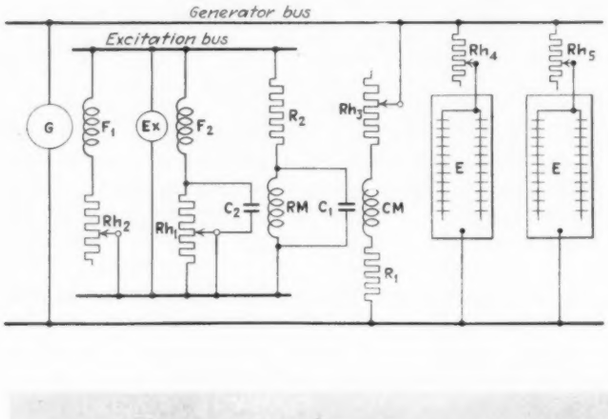
From the standpoint of regulator application, generators used for electrolytic processes may be divided into three general classes:

(a) Those designed for self-excitation.

(b) Those using a separate exciter.

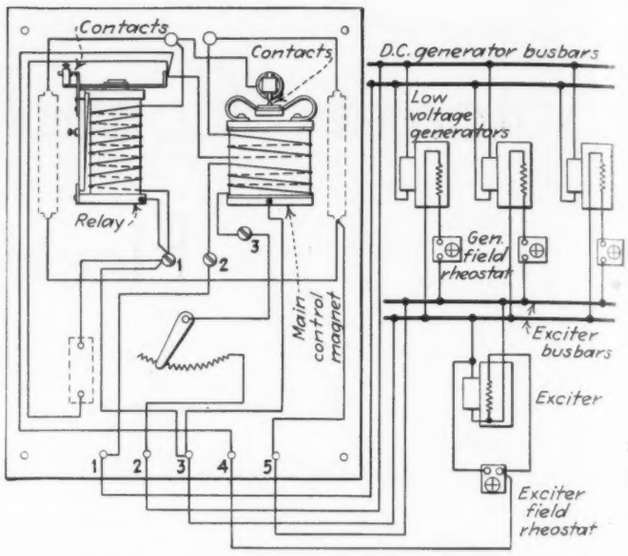
(c) Those excited from an approximately constant voltage source, such as a shop lighting or power circuit.

Generators of class (a) are seldom used in modern practice for low-voltage service; i.e., below 15 volts, except in comparatively small sizes. This is mainly because the shunt field current for a given machine is relatively high and the field rheostat becomes more or less cumbersome and subject to contact trouble when exposed to plating room fumes. Regulators can be applied to low-voltage generators of this class, but do not generally give as satisfactory results as when a higher source of excitation is used.



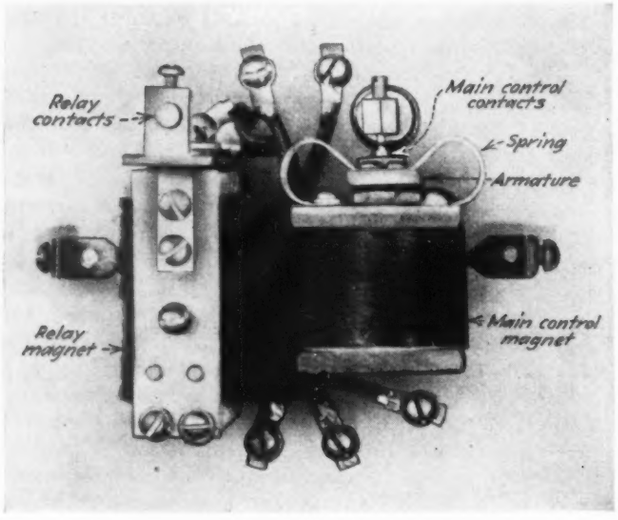
Generators of class (b) with a separate exciter are used when it is desired to operate over a broad voltage range and when it is desired to reduce the wattage loss in the field rheostat to a minimum. In many instances a separate direct-current source of suitable voltage is not available, which makes the selection of a generator of this class a necessity.

On the other hand, when the voltage range is small



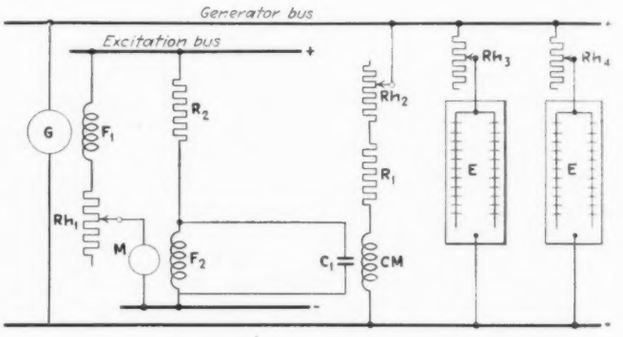
Voltage regulator applied to parallel generators

Bus voltage actuates regulator which controls field current of the common exciter



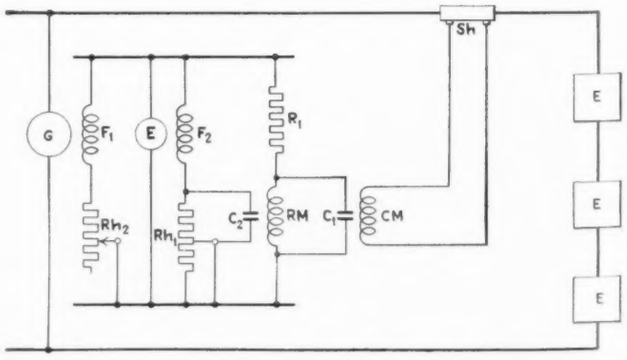
Voltage regulation for tanks in parallel

Separate excitation maintains constant voltage by control of exciter through the medium of main control magnet *CM*, responsive to generator voltage, actuating field relay contacts C_1 and C_2. Rheostat RH_3 is principal determinant of the particular value of voltage to be held; contacts C_1 just touch when armature of main control magnet *CM* is energized to point of balance with its spring. Generator voltage range from, say, 5 to 15 volts may be obtained by designing RH_3 to absorb the difference between the 10 volts range and the resistance drops in *CM* and R_1.



Counter-emf. regulator for constant voltage excitation source

Armature of counter-emf. motor *M* is in series with generator field across excitation bus. Rheostat Rh_1 is set to give unregulated voltage above normal. Generator field current rotates armature of counter-emf. motor rapidly in reaction with full excitation on its field F_2, contacts C_1 vibrate rapidly across field F_2 to give constant voltage regulation



Constant current control for series tanks

Drop across shunt subjected to tank current actuates main control relay which determines exciter voltage

and a source of suitable direct current is at hand, generators of class (c) give very satisfactory results and are readily adaptable to automatic regulation.

The above brief discussion leads up to the actual selection of voltage regulators to fit the various classes of generators.

Two classifications of regulators

Voltage and current regulators most frequently used in modern electrolytic practice are of two general types: First, there are those in which the contacts are connected across the entire generator shunt field rheostat or a portion of it; when in operation they vibrate rapidly, so as to open and close a circuit around the rheostat. Second, there are those which employ the well-known counter-emf. principle of bucking down the shunt field current by means of a motor armature connected in series with the shunt field circuit, the motor field strength being controlled by the regulator contacts.

Within certain limits the first class, or rheostatic type of regulator, is applicable to all three classes of the above-mentioned generators. To class (a) and (c) it is applicable when the generator capacities are relatively small and to class (b) it is applicable in practically any capacity met in modern practice.

The second class, or counter-emf. type of regulator, is particularly applicable to class (c) generators in large capacities, when the shunt field current is relatively high. This is because a single set of main control contacts will handle the shunt field of a small counter-emf. motor, which in turn will control a very large shunt field current in the main generator.

The accompanying elementary diagrams illustrate the above-mentioned regulators. Each diagram is shown in such simple form that the principle of operation can be easily grasped. Each has a number of modifications. The following descriptive symbols apply to these diagrams:

C_1—Main control contacts.	F_1, F_2, F_3—Fields.
C_2—Relay contacts.	G—Generator.
CM—Control magnet or solenoid.	M—Counter-emf. motor.
	R_1, R_2—Resistors.
E—Electrolytic units.	Rh_1, Rh_2, Rh_3—Rheostats.
EX—Exciter.	

In each of these diagrams the coil CM is to be considered the master control magnet, which is shown either connected across the busbars through a suitable resistance for voltage regulation or across a shunt, when current is to be regulated. This coil actuates the main control contacts, which, being kept in a state of continual vibration, bring about the desired regulation.

It frequently becomes necessary to interpose one or more relays between the main control contacts and the point of application.

Anti-hunting windings are used in a number of the regulators in order to obtain more rapid contact action, which, under certain conditions, greatly improves regulation, and especially so in cases where very accurate regulation is desired.

It frequently becomes necessary to hold the current constant through a given process. The regulator for this service is very similar to the constant potential regulator, the essential difference being that the main control magnet is designed for holding constant current instead of constant voltage.

When a constant voltage source is available for exciting one or more low-voltage generators a voltage regulator of the counter-emf. type usually gives excellent results.

Regulation is brought about by means of the counter-emf. motor, the armature of which is in series with the shunt field of the low-voltage generator across the excitation bus. The control contacts of the magnet are connected across the field of the counter-emf. motor and short circuit this field when they close. A resistor in series with the field limits the current through the contacts to a safe value.

Regulators and counter-emf. motors have been designed for practically any voltage and shunt field current values met in modern practice.

The following notes relative to the upkeep of regulators in general may prove helpful:

1. Keep the regulator clean. Dirt on the contact surfaces is especially harmful to good regulation.
2. Inspect each regulator at least once every month in order to see that the general adjustments are correct and that parts such as contacts, pivots and bearings are in good condition.
3. Contacts in particular should be cleaned at regular periods and when badly pitted should be removed and carefully reconditioned on a fine grain grinding wheel.
4. When the counter-emf. type of voltage or current regulator is used see that the surface of the motor commutator is kept in good condition and that the brushes are free to move in the brush holders.
5. If an adjusting rheostat is used in series with the main control magnet see that the surfaces of the rheostat buttons are kept clean at all times.
6. It will usually be found that the upkeep of regulators used with electrolytic processes will be much less when the regulator is installed in a room or location away from the electrolytic work.

Free Speech—An American Ideal

Sustaining my charge that a leading part of the campaign against the utilities is an attempt to throttle the constitutional right of free speech, one of the bills introduced in the present legislative session in Wisconsin may be cited.

This bill, which would amend the corrupt practices act, forbids any corporation, directly or indirectly, either to support or oppose any proposed constitutional amendment, legislative measure or other question submitted to referendum vote of the people. Amendments directly affecting public utilities have passed the legislature and are to be submitted in Wisconsin. Evidently, the plan is to fix it so that the utility companies cannot lawfully defend the interests and rights of their stockholders or debate the statements of the opposition.

What a betrayal of American principles; what a cowardly attempt to stifle the expression of opinion and the presentation of facts!

W. H. HODGE,
Vice-President
Byllesby Engineering & Management Corporation, in an address at Parsons College, Fairfield, Iowa.

What Can Be Learned from the Merchandising Survey?

WHAT can the individual utility learn from the data on utility merchandising graphically presented last week on pages 1009 to 1020? For one thing it can compare its own achievements with the averages for the United States or its own region and determine whether the conditions under which it operates impose more or less sales resistance than elsewhere. Some of these conditions are not within control and methods have to be adopted to offset them. But many conditions are within control and the experiences related raise the question whether the majority practices of sections which have done a better job can be adopted, in modified form at least. Of course living habits, regional conditions, prior sales activity, saturation and competition with electric service have a definite bearing on yearly sales results, but these conditions will not be accepted as excuses, but rather as challenges, by aggressive sales staffs.

Until the electrical industry organizes itself to sell complete home electric service, which is being tried in several sections, it does not seem unreasonable to assume that each company should at least achieve the U. S. average of accomplishment, and because conditions are more favorable in some places than others, it should be possible to attain the average of the region of which the utility is a part. If unusually favorable local conditions exist, better results than the average can be attained.

Considering the achievements recorded, $12 merchandise revenue per domestic customer per year should not be too high a goal to set in view of the $15–$18 average revenue being earned in many sections. The Southwest has sold as high as $30 per customer per year and the maximum per customer does not drop below $20 in any section. The sales expense to secure the average revenue averages about 20 per cent of the merchandise revenue or about $2.50–$3 per customer. But 23–27 per cent is spent with good results in some sections.

The average reported consumption of domestic customers, namely, 500 kw.hr., should certainly be attained, as 500–680 are being consumed in the Southeast, Middle Atlantic and Mountain and Pacific States on the average. When a company in the East North Central district, where coal, gas and oil are available, can average 2,004 kw.-hr. per domestic customer, 500 kw.-hr. looks like a very low figure for which to strive.

Which is wanted—a high energy revenue or a high merchandise revenue per customer? A high combination would seem most reasonable, but since utilities are primarily selling energy it would be more logical to concentrate on building energy revenue. To do this, encouragement of merchandising by all sales channels with some plan to stimulate energy consumption is needed.

Since ranges, water heaters, refrigerators and ironers offer the best possibilities of building consumption they may be expected to contribute the most to energy revenue. Cannot the 40 per cent increase in range sales in the East North Central section or the 100 per cent increase in the Middle Atlantic and Southeast be approached by more companies? More than eight units were sold in one year per 1,000 customers on the average among the companies reporting and records of 11–20 units per 1,000 customers were attained in three sections. Water heater sales have been greatly stimulated (100–225 per cent) in the Middle Atlantic and Southeast states, but 1.4 sales per 1,000 customers seem low when 2–6 per 1,000 customers have been sold in some sections in one year. Besides, ranges and water heaters constitute a unit of service that might be sold as such instead of piecemeal.

Refrigerators have gained such public acceptance that 11.5 units were sold per 1,000 customers in 1930 on the average and three sections attained 15–17 sales per 1,000 customers. Are all utilities reaching this quota?

While the South, with its hotter weather, should be the section where electric ranges and refrigerators should

Merchandise revenue per customer.
Energy consumption per customer.
Energy vs. merchandise revenue.
Relative values of devices as revenue builders.
Unit sales per customer.
Factors affecting trade relations.
Sales facilities necessary.
Allocation of sales expenses.
Remuneration of salesmen.
Duration of campaign periods.
Price policies and inclusion of installation charge.
Installment payment and servicing practices.
Purchasing channels and discounts.

have particular customer appeal, conditions elsewhere make other advantages of these devices attractive.

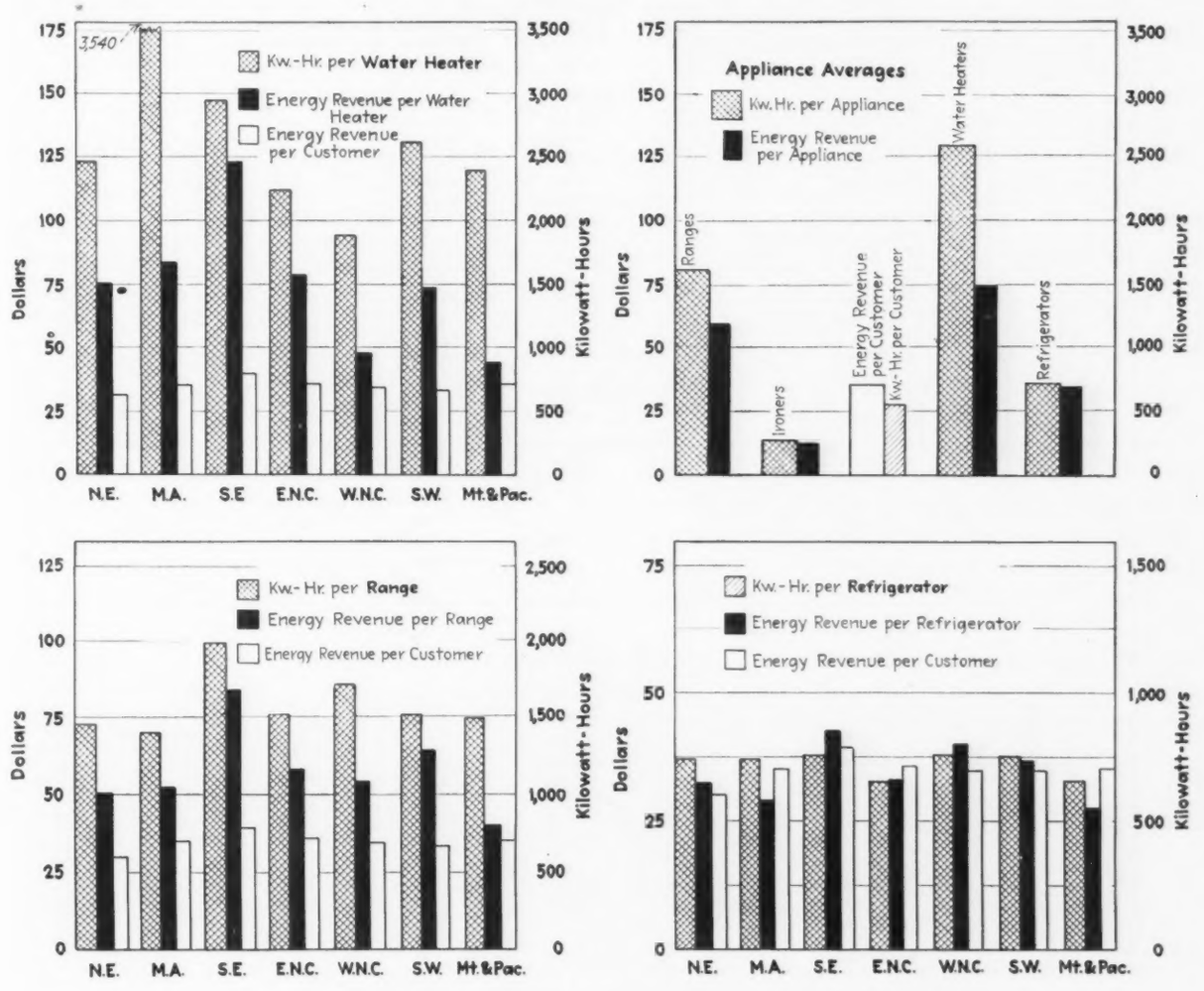
Ironers have apparently found an appeal in the West North Central States, where 2.7 units have been sold per 1,000 customers in a year. Why not elsewhere?

Why is the promotion of oil burners being neglected by utilities? Is the utility sale of gas making these units an unattractive electrical load, or is it because specialty dealers should logically handle them? If the latter, are they being hampered in their activities?

Where merchandise revenue is wanted to help pay the expenses of new business promotion, it is worth remembering that the reports show that electric washers, radios, vacuum cleaners, incandescent lamps, flatirons and floor and table lamps contribute most of the revenue from smaller appliances (87 per cent) in the order named. Except for a few sections, the saturation of health lamps, floor polishers, electric clocks and fans is relatively low. The Southeast and Southwest have done better on selling these particular devices than other sections, so if a company wants to know how to increase the merchandise revenue therefrom it might be advisable to study methods used in the South.

Good trade relations are more important than utilities being in the merchandising business, but it is possible to have both if the trade viewpoint is considered. This viewpoint cannot be ascertained from the desk or without a receptive attitude.

Just considering heavy-duty appliances alone, the majority of utilities engage contractors to wire and install ranges and water heaters, for which they are paid a price that covers cost plus a profit. Many utilities charge



How the energy consumptions and revenues per device compare

Based on the average energy consumption and revenue per device, water heaters, ranges, refrigerators and ironers are attractive loads in the order named, their annual unit consumptions being in the following proportions 10: 7: 3: 1.

Refrigerators produce an annual unit consumption approximately 30 per cent more than the average annual consumption per customer.

The average annual costs of energy for ranges, water heaters and refrigerators are about $59, $75 and $35, respectively. However, the regional reports show a wide variation in both energy consumption and revenue per water heater ranging from 1,900-3,540 kw.-hr. and $44-$123. The variations are not so great on ranges, the energy consumption hovering around 1,500 kw.-hr., with 2,000 in the Southeast, and operating cost being more nearly the average but rising to $85 in the Southeast and dropping to $37 in the Mountain-Pacific section. Refrigerator consumption strikes about 750 kw.-hr. in all sections except the East North Central and Mountain-Pacific states, where it is about 650.

It will be observed that the unit energy cost for ranges and water heaters is relatively low in the Mountain-Pacific and West North Central sections and also in the Middle Atlantic section for water heaters.

Practices and Achievements of Eleven Companies Showing Significant Records

Eleven companies' practices and achievements have been listed by companies. The companies selected are those whose reports were most complete and show some significant record on total merchandise revenue, per cent increase, saturation of some major device, kilowatt-hour per domestic customer, energy or merchandise revenue per customer.

Some record achievements are indicated by heavier type, but examination of the tables will show others, because the conditions under which achievements were made, such as number of customers, average rate, saturation, etc., have considerable bearing on the significance of results. For example, company No. 707, with a 40 per cent saturation of ranges, sold nearly 32 units per 1,000 customers in 1930, whereas company No. 404, with 33 per cent saturation, sold 39 per 1,000 customers.

After examining the achievements, it will be interesting to observe the corresponding sales facilities, sales expense per customer, allocation of sales costs, practices affecting trade relations, price practice, payment of salesmen, and installment and servicing policies.

Co. No.	Total Unit Sales 1930	Per Cent Increase 1930/1929	Total Merchandise Revenue 1930	Per Cent Increase 1930/1929	Est. Kw.-Hr. from Appliances 1930	Est. Annual Energy Revenues from 1930 Sales	Aver. Rate per Appliance, Cents per Kw.-Hr.	Per Cent Saturation of Appliances	Appliances Sold per 1,000 Customers
				Ranges					
106	258	+ 360	$42,286	+ 435	387,000	$11,610	3.0	1	5.6
206	146	+ 78	24,898	+ 40	219,000	8,665	3.95	0.0065	6.8
303	1,930	+ 148	276,121	+ 148	3,474,000	.....	....	....	**39.4**
406	716	+ 112	110,500	+ 117	1,074,000	35,800	3.34	3	11.0
506	255	— 20	34,216	— 32	459,000	14,025	3.06	2	5.1
604	183	**+1420**	25,779	+1265	219,600	6,588	3.0	0.6	3.2
609	534	— 20	62,950	— 22	768,900	29,370	3.8	10	14.8
707	791	— 26	94,137	— 30	.....	29,267	....	**40**	31.6
709	345	— 10	47,746	— 14	621,000	24,800	4.0	10	19.7
710	**4,966**	— 16	**695,240**	— 16	**7,449,000**	**198,640**	2.66	33.3	38.6
404	118	+ 181	15,630	+ 123	.....	.....	....	....	....
Total*	**10,261**		**$1,431,633**		**16,000,399**	**$528,733**			
				Water Heaters					
106	1	.....	$75	.....	3,000	$90	3.0	....	0.02
206					No 1930 data given				
303	503	+ 272	**60,921**	+ 272	1,509,000	.....	....	....	10.4
406	26	.....	4,200	+ 5	78,000	1,560	2.0	....	0.4
506	5	— 66.7	338	— 71	3,333	100	3.0	....	0.1
604	3	+ 50	347	+ 61	7,290	146	2.0	....	0.05
609	120	— 17	14,643	— 16	122,400	4,800	3.9	1	3.3
707	345	+ 116	11,311	+ 174	.....	5,375	....	9	**13.8**
709	141	— 47	11,467	— 47	169,200	6,800	4.0	5	8.1
710	**1,706**	— 8	51,180	— 8	**5,298,000**	**68,040**	1.28	**13**	13.2
404	3	.....	355	.....	.....	.....	....	....	....
Total*	**2,853**		**$154,837**		**8,024,973**	**$149,146**			
				Refrigerators					
106	326	+ 86	$88,237	+ 97	260,800	$13,040	5.0	8	7.1
206	328	+ 31	94,528	+ 31	237,800	8,249	3.46	0.0152	15.2
303	1,783	+ 88	465,095	+ 91	**1,283,760**	.....	....	....	36.7
406	**2,108**	— 11	**496,000**	— 9	1,264,800	63,240	5.0	16	32.4
506	1,134	— 13	355,317	— 11	1,240,800	**55,192**	4.45	18	22.8
604	965	+ **302**	314,488	+ **291**	739,190	29,068	3.93	12	16.7
609	722	+ 4	204,887	— 1	406,480	25,270	6.2	1	20.0
707	211	+ 32	65,994	+ 70	.....	.....	....	12	8.5
709	786	+ 34	235,548	+ 32	707,400	28,296	4.0	15	**44.8**
710	734	+ 19	201,850	+ 19	440,400	8,808	2.0	8	5.7
404	43	+ 8	14,542	+ 44	.....	.....	....	....	....
Total*	**9,389**		**$2,606,686**		**6,950,430**	**$325,431**			
				Ironers					
106	42	+ 91	$3,381	+ 74	15,120	$756	5.0	....	0.91
206	3	— 40	180	— 82	375	27	7.2	0.00014	0.14
303	20	— 31	1,293	— 33	4,800	.....	....	....	0.4
406	216	— 8	19,000	— 10	**54,000**	**2,700**	5.0	**15**	3.3
506	225	— 18	15,654	— 16	45,000	1,880	4.0	5	4.5
604	20	+ **570**	1,717	+ **485**	3,540	212	6.0	....	0.34
609	62	+ 130	3,100	+ 130	43,400	1,736	4.0	5	1.7
707	245	— 52	18,682	— 50	.....	.....	....	8	**9.8**
709	56	— 30	3,943	— 33	10,752	689	6.4	5	3.2
710	**298**	— 4	**19,985**	— 3	.....	.....	....	3	2.3
404	30	.....	2,456	— 7	.....	.....	....	....	....
Total*	**1,280**		**$93,951**		**279,387**	**$15,416**			

*Totals have been adjusted to compensate for omissions.

Factors Affecting Trade Relations

♧ = Yes △ = No

Company Identification	106	206	303	406	506	508	604	609	707	709	710	404
Contractors engaged to install ranges and water heaters	♧	△*	♧	♧	♧	♧	♧	♧	♧	♧¶	♧	△
Pay contractors cost + profit	..	△*	♧	..	♧	..	△	..	..	♧	..	△
Pay contractors flat rate	..	△	..	♧	..	..	♧	♧	♧	..	♧	△
Installation costs charged on bills	..	△	♧	♧	♧	♧	♧	♧‡	♧	♧	♧	..
Carry installment accounts for dealers	..	△	△	♧	♧‡	♧	△	△	△	△	△	△
on same terms as utility sales	..	△	..	♧	♧	♧	△	..	..	..	..	△
Dealers are financially able to participate in utility special term campaigns	..	♧	♧†	♧‡	♧	♧	♧	♧	♧	♧	♧‡	△
Dealers given discount if purchase from utility stock	..	♧	♧	♧	♧	♧	△	♧	♧	♧	△	△
Marked success in decreasing inadequate wiring	..	♧	♧	△	♧	..	♧	♧	△	△	♧	..
Bonus to dealers on sales based on energy revenue	..	..	△	△	△	..	△	△	△	△	..	..
Commissions to dealers for sales	..	..	△	△	△	△	△	△	♧§	△	..	△

* Occasionally; are paid cost + profit † Doubtful. ‡ Some. ¶ Utility installs, contractor does wiring. § 20 per cent.

Sales Facilities, Revenue and Expense

♧ = Yes △ = No

Co. No.	Thousand Customers per Store	Store Salesman	Field Salesman	Demonstrator	Kw.-Hr. per Customer	Energy Revenue per Customer	Merch. Revenue per Customer	Sales Expense per Customer	Per Cent Merchandise Revenue: Total Merch. Sales Exp.	Rent	Salaries	Commissions and Bonuses	Advertising	Sales Bogie Based on Desired Business	Sales Bogie Based on Merch. Revenue
106	46.0	....	6.6	46.0	460	$23.51	.....	.....	.....	...	....	....	...	△	♧
206	21.5	21.5	3.1	21.5	800	42.00	$7.97	$1.02	12.8	0.8	4.5	2.4	...	..	..
303	1.3	8.1	1.3	16.2	594	41.00	22.10	3.42	15.4	1.4	3.3	9.2	2.4	♧	♧
406	5.9	4.3	0.8	9.3	627	39.87	20.20	5.65	28.0	0.9	3.6	17.9	4.3	♧	△
506	1.7	4.2	1.4	24.9	555	28.98	21.40	4.17	19.4	1.5	11.9	3.2	1.8	△	♧
508	17.0	5.7	0.9	8.5	550	48.00	.....	....	.....	...	....	....	...	♧	△
604	19.3	3.9	2.1	58.0	520	29.75	9.30	2.73	29.3	1.6	....	....	5.0	♧	△
609	0.5	12.0	1.2	....	557	41.53	24.05	5.34	22.1	1.0	2.7	9.7	3.5	△	♧
707	3.6	2.8	1.9	25.0	1350 one city 1150 all branches	....	13.87	2.91	20.9	...	7.2	4.3	4.4	△	♧
709	4.4	8.8	0.9	17.5	637	37.81	23.50	3.09	13.2	0.8	1.2	7.7	2.5	△	♧
710	2.0	1.8	1.2	20.8	1,109	36.76	11.54	....	.....	...	....	....	...	♧	♧
404	....	....	...	....	2.004	76.08	.....	....	.....	...	....	....	...	..	..

Range and Water Heater Prices and Costs of Installation

♧ = Yes △ = No.

Company Identification	106	206	303	406	506	508	604	609	707	709	710	404
Advertised prices include installation	♧	♧	♧	♧	♧	△	♧	♧	♧	♧	♧	♧[4]
Installation cost absorbed by utility	♧	△	△	△	△	△	♧[1]	△	△	△	♧	△
charged to capital cost	♧	△	△	△	△	△	..	△	△	△	△	△
charged to sales expense	..	△	△	..	△	△	♧	△	△	♧	♧	△
extended to dealer sales	△	△	..	♧	..	△	△	△	..	△	♧[3]	△
Sell at list	♧	♧	♧	♧	♧	♧	♧	♧	♧[2]	♧	△	♧
Cost of installing ranges—dollars	60	40	30	20-25	35	..	53	25	35	3.75	40	25
Cost of installing water heaters—dollars	..	..	36	25	35	..	..	15	..	8.41	10	..

[1] Part. [2] Plus carrying charge. [3] On ranges only. [4] Installation cost is charged to operating expense account.

Payment of Salesmen

♧—Yes △—No

Company Identification	106	206	303	406	506	508	604	609	707	709	710	404
Annual income of store salesmen (average)	....	1,000	1,900	2,700	1,560	1,100	1,500	1,200	1,500	1,900	1,800	....
field salesmen (average)	1,560	1,800	2,200	2,540	2.650	1,800	2,000	2,000	2,040	2,456	2,500	....
Flat salary only	△	△	△	△	△	△	△	△	△	△	△	....
Commission only—per cent	10 to 15	Aver. 10	△	△	△	10-15†	10-20	△	△	△	△	....
Salary and commission—dollars and per cent	△	△	600+5	900–1,800 +5–2)	1,02)– 2,400+ 1-5	..	..	1,500– 2,100+5	1,560+ 5–1st 6 sales 10–next2 15–each one over	480–720 +8–12	1,200– 2,100+ 10–12	600+8– 10–1[7]
Bonus on estimated energy revenue	△	△	♧*	△	♧†	△	△	△	△	△	△	△
Salary or commission + bonus	△	△	△	△	△	△	△	△	△	△	[illegible]	....

* Ranges, $15; refrigerators, $10; water heaters, $7.50 to $15.
† $125 drawing account. ‡ Ranges, $1 per kilowatt. Water heaters, $1 per kilowatt.

Installment Payment Practices

Company Identification	106	206	303	406	506	508	604	609	707	709	710	404
Ranges—												
Per cent down	10	10	10	10	5 (min.)	..	10	10	10	5	10	10
Time to pay (months)	12-24	18	..	24	24 (max.)	12	18	12	18	..	12	12-1[illegible]
Waterheaters—												
Per cent down	10	10	10	10	5 (min.)	..	10	10	10	5	10	10
Time to pay (months)	12-24	18	..	24	24 (max.)	12-24	18	12	18	12	12	12-18
Refrigerators—												
Per cent down	10	10	10	10	$10 (min.)	..	10	10	8-10	3-20	10	10
Time to pay (months)	12-18	18	..	24	..	12-24	24	12	12-24	24	15	12-18-24
Ironers—												
Per cent down	10	10	10	15	5 (min.)	..	10	10	5-6	10	10	10
Time to pay (months)	12-24	12	..	12	24 (max.)	..	12	12	18	15	12	10

Servicing Practices on Heavy-Duty Appliances

L = Life of unit. M = Material only. G.P. = Manufacturer's guarantee period. T.M. = Time and material. F = Free.

Company Identification	106	206	303	406	506	508	604	609	707	709	710	404
Ranges—												
Servicing period (months)	L.	12	G.P.	G.P.	12	12	12	G.P.	12	12	..	12
Basis of charge	M.	..	M.	T.M.	T.M.	..	F.	T.M.	M.	F.	T.M.	7½-12 10½-18
Water Heaters—												
Servicing period (months)	12	12	G.P.	..	12	12-24	12	G.P.	12	12	..	12
Basis of charge	M.	..	M.	..	T.M.	..	F.	T.M.	M.	F.	T.M.	7½-12 10½-18
Refrigerators—												
Servicing period (months)	L.	12	G.P.	..	12	12	36	G.P.	..	24	..	24
Basis of charge	M.	..	..	..	T.M.	..	F.	T.M.	..	F.	F.	..
Ironers—												
Servicing period (months)	12	12	G.P.	..	12	12	12	G.P.	..	12	..	3
Basis of charge	M.	..	M.	..	T.M.	..	F.	T.M.	..	F.	T.M.	10%

the installed cost on the customers' bills, but this price practice will be discussed later. While only about one-third of the utilities carry dealers' accounts, perhaps there is no reason for doing so unless the dealers need or seek this assistance, since any semblance of paternalism is obnoxious to some people.

About 37 per cent of utilities report that they encourage dealers the same as they do their own salesmen, by paying a commission on sales (as high as 25 per cent and averaging 12¼ per cent), but no commission is based on energy revenue produced. Since the proper balance of attention between energy revenue and merchandise revenue is necessary an energy revenue commission deserves consideration. Some comments on this subject are included later.

Sales facilities apparently need study as they differ greatly. Three sections—New England, Middle Atlantic and Southeast—average one field salesman for every 2,100 customers, whereas the East North Central section has one salesman for every 1,500 customers. Some companies in every region have one salesman for every 800–900 customers. Doubtless the latter practice is unnecessary except in sparsely settled districts, but the large number of customers which some salesmen have to cover prohibits intimate contact.

Likewise with stores. Should a store serve a territory of 12,000–12,500 domestic customers as in New England and the Middle Atlantic sections, or 5,000–6,000 as in the Southwest and Mountain and Pacific territories? In some systems a store is provided for every 2,000–3,000 customers. The answer depends chiefly on the density of population, convenience to customers and the load-building activity of other agencies.

Allocation of sales expenses is another topic deserving study. Doubtless some utilities base their expenditures on the new business desired, but others base it on merchandise revenue earned. Based on the latter, it is interesting to observe that four sections which did a particularly good merchandising job last year spent 12–15 per cent of their merchandise revenue about equally divided between salaries and commissions. The total amount and proportions depend on what is necessary to make salesmen give every customer adequate attention after a sale is consummated and still stimulate acquisition of new business.

Rent, or its equivalent, does not seem to be assessed its proper value in some cases, although it is recognized that utilities frequently utilize space for merchandising that would have to be provided anyway.

Advertising, an integral part of sales expense, ranges from 3½–4½ per cent of merchandising revenue for four districts. Is this method of creating mass impression and thereby leaving salesmen more time to discuss specific conditions used as much as it should be to help sales? It doesn't seem so. Of course, the value of any advertising depends on the medium used and phrasing the message so it arouses buyer interest.

Remuneration of field salesmen seems low—$1,200–$3,000, with an average of $2,000. The payment is not low if able salesmen can be secured at these rates in competition with other sales occupations, but it seems that much better results could be secured if higher remuneration were paid to attract better salesmen. One company pays field salesmen as high as $3,600 plus 10 per cent commission and does a very good sales job.

To balance the sales effort on securing merchandise and energy revenue, it appears necessary to have a commission embodying a factor based on energy revenue produced, like some companies have adopted; e.g., 1 cent per kilowatt-hour, 4 per cent of commercial and flat-rate revenue, $1 per kilowatt, $2 per range, $1 per refrigerator and $4 per water heater. But this factor should not be so high that the salesman is stimulated to consider energy consumption above customer satisfaction.

If the composite sales effort of utilities on heavy-duty appliances (showing variations over the year in sales promotion on different devices) has any basis of reason it would seem that May and November have been found to be the best months to sell ranges and water heaters and May the best time for refrigeration. Is there any evidence to support this deduction? There is so much to be said pro and con about either continuous or repeated short-term sales efforts that the length of campaign periods is mentioned only to renew consideration of which procedure has the most merit.

Price policies and wiring and installation cost have raised so much discussion that it should be interesting to observe that 90 per cent of the utilities report that advertised prices of ranges and water heaters cover installation. More than 50 per cent of the companies absorb the installation cost either in sales promotion expense or capital account, where this practice is allowed. Nearly 85 per cent base their advertised price on list price.

Cost of wiring and installing ranges runs as high as $75 and averages $35, while the corresponding figures for water heaters are $55 and $24. Since these units are complementary the cost of wiring and installing both devices together should be considered.

Absorption of installation cost needs elaboration to

the extent that, if followed, this practice should be extended to other sales outlets so there will be no criticism of unfair trade practices. Expenses of promoting new business, which are not out-and-out merchandising expenses, but necessary for pioneering and developing new business that will reduce the unit cost of power, should be allowed as utility operating expenses. Whether range and water heater wiring expense is chargeable to capital account depends on several factors: Whether the property of the utility in a home stops at the meter or at the outlet; whether equipment installed by a utility so it cannot be removed without injuring the customer's property becomes the property of the customer or remains utility property, etc.

Attainable saturation is so often questioned that the 40 per cent saturation of ranges and 13 per cent saturation of water heaters on the West Coast might be considered figures for which to strive. It is recognized that competitive sources of heat have a definite influence, but some companies in sections having gas, oil or coal or the combination have accomplished results.

Refrigeration has received such wide public acceptance that 25 per cent saturation has been obtained on one system and 12–16 per cent is reported by four sections. Ironers, little pushed by some utilities, have been sold to 15 per cent of the customers of some Middle Atlantic and East North Central companies and to 10 per cent in the West North Central zone.

Installment payment and servicing practices are two policies that have considerable influence not only on customer acceptance but on trade relations. Ten per cent down with eighteen months to pay on ranges and water heaters, 24 months on refrigerators and twelve months on ironers represents the majority practice. Twelve months or the manufacturer's guarantee period with a time and material charge represents the majority practice on utility servicing, although free servicing is quite extensively rendered on water heaters and refrigerators.

However, the records show more liberal terms by some companies. If more liberal terms must be offered to secure customer acceptance, they should be offered only after convincing the remainder of the trade that they are necessary and jointly working out some arrangement which does not place a hardship on other sales outlets.

Finally, there has been a question among the trade regarding the channels through which utilities purchase and the discounts they receive. Purchases through jobbers are made by 62 per cent of the utilities on ranges, 40 per cent on water heaters, 70 per cent on refrigerators and 55 per cent on ironers, indicating that utilities are not circumventing distribution channels as much as some persons claim. A very small portion of the purchases are being made on holding company contracts—10 per cent from manufacturers and 35 per cent from jobbers. Discounts are chiefly 40 per cent from both manufacturers and jobbers, except on refrigerators, for which both 30 per cent and 40 per cent figure conspicuously, the lower discount being most prominent from jobbers. These discounts indicate that jobbers are giving as good discounts as manufacturers, in most cases, so there should be less inclination to circumvent economic distribution channels.

Merchandise Revenue and Corresponding Energy Revenue per 1,000 Customers

Co. Identification	Per 1,000 Customers: Merch. Rev.	Est. Kw.-Hr. From 1930 Appliance Sales	Est. Energy Revenue From 1930 Appliance Sales	Energy Rev. From 1930 Appliance Sales Per Merchandise $
Ranges				
106	$920	8,400	$250	$0.27
206	1,160	10,000	400	0.35
303	5,700	71,500	.....	....
406	1,700	16,500	550	0.32
506	690	9,200	280	0.41
604	440	3,800	110	0.26
609	1,740	21,300	810	0.47
707	3,760	.....	1,170	0.31
709	2,720	35,400	1,410	0.52
710	5,400	57,700	1,540	0.29
404	530	.....	.....	....
Max	5,700	71,500	1,540	0.52
Median	1,700	16,500	550	0.37*
Min	440	3,800	110	0.26
Water Heaters				
106	$2	65	$2	$1.20
206	.....	.....	.....	....
303	1,255	31,100	.....	....
406	65	1,200	24	0.37
506	7	67	2	0.30
604	6	126	3	0.42
609	405	3,390	133	0.33
707	452	.....	215	0.48
709	655	9,650	388	0.59
710	398	41,100	529	1.33
404	13	.....	.....	....
Max	1,255	41,100	529	1.33
Median	231	2,295	79	0.96*
Min	2	65	2	0.30

* Weighted average.

Co. Identification	Per 1,000 Customers: Merch. Rev.	Est. Kw.-Hr. From 1930 Appliance Sales	Est. Energy Revenue From 1930 Appliance Sales	Energy Rev. From 1930 Appliance Sales Per Merchandise $
Refrigerators				
106	$1,923	5,670	$282	$0.15
206	4,400	10,900	382	0.09
303	9,600	26,400	.....	....
406	7,650	19,450	975	0.13
506	7,140	24,950	1,100	0.16
604	5,425	12,640	500	0.09
609	5,670	11,270	700	0.12
707	2,640	.....	.....	....
709	13,400	40,300	1,610	0.12
710	1,565	3,420	68	0.04
404	515	.....	.....	....
Max	13,400	40,300	1,610	0.16
Median	5,425	12,640	600	0.13*
Min	515	3,420	68	0.04
Ironers				
106	74	329	16	0.23
206	8	17	1	0.15
303	27	99	.....	....
406	292	830	42	0.14
506	314	905	36	0.12
604	30	61	4	0.12
609	86	1,200	48	0.56
707	747	.....	.....	....
709	225	613	39	0.17
710	155	.....	.....	....
404	87	.....	.....	....
Max	747	1,200	48	0.56
Median	87	471	36	0.16*
Min	8	17	1	0.12

Phase Faults Analyzed on D.C. Calculating Board

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WHEN a three-phase short circuit occurs on a three-phase power system the short-circuit currents in the three conductors can be represented by three symmetrically arranged vectors of equal length and spaced 120 deg. apart as shown in Fig. 1a. When a single-phase-to-ground short circuit occurs on a three-phase grounded system the vectors representing the current in the various branches of this system are not symmetrically arranged, but are unsymmetrically arranged (Fig. 1b), the magnitude and direction of the vectors depending upon the system constants. These unsymmetrical vectors can, however, be resolved into three sets of symmetrical component vectors called positive, negative and zero phase-sequence components. It can be seen, therefore, that if we can determine the value of these symmetrical components of the current in all the branches of a network when one of the phases is grounded, we can determine the current flowing in all of the conductors of the network. It is the purpose of this article to describe a method whereby with the assistance of the direct-current calculating table the value of these symmetrical components can be readily determined for any system or network.

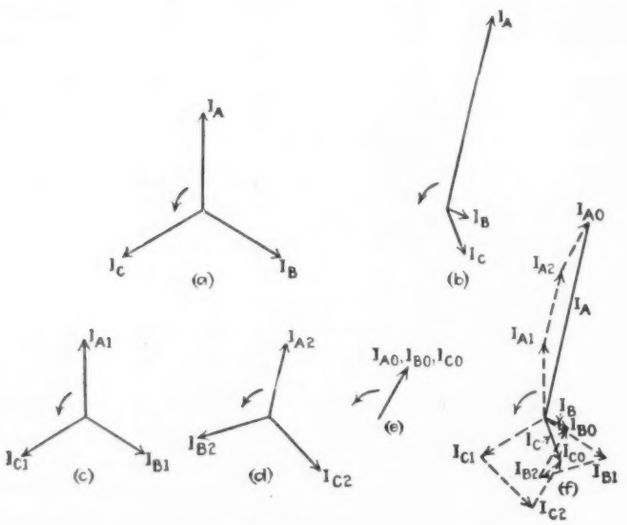

Fig. 1—Unsymmetrical fault currents may be converted to symmetrical components

(a) Symmetrical three-phase short circuit; (b) unsymmetrical single-phase to ground fault; (c), (d), (e) positive, negative and zero sequence components; (f) these symmetrical component vectors when added together vectorially give the original unsymmetrical set of vectors. In this figure I_A represents the current in the grounded phase and I_B and I_C represent the current in the good or ungrounded phases.

The first step is to determine the magnitude and direction of the current which will flow in all of the branches of the network assuming a three-phase short circuit at all of the points in the network where single-phase-to-ground short circuits are to be considered. A single-line diagram of the system is drawn with circles representing all transformers, reactors and synchronous equipment and also with circles placed at the middle of all transmission lines. The reactance of all equipment and transmission lines expressed in percentage on a common base is placed in the lower half of the circles, and the number of the rheostats which are to represent the equipment on the calculating board is placed in the upper half of the circles.

A calculating-board diagram for the system is then drawn as shown in Fig. 5a for the system assumed in Fig. 4.

The system is then set up on the calculating board in accordance with the diagram just described, and desired readings are taken of the current in the branches of the network for all the fault locations which are considered. The readings thus obtained when multiplied by the proper constants represent the currents in the branches of the network for these three-phase short circuits.

The next step is to determine the zero-phase sequence components of the current in all of the branches of the network for single-phase-to-ground short circuits at all of the points in the network where three-phase short circuits were assumed above. A single-line diagram called the zero phase-sequence diagram is made up similar to the previous diagram except that only those transmission lines of the system are shown in which ground currents can flow when one of the conductors is grounded. All rotating synchronous equipment with

Single-phase-to-ground shorts create unsymmetrical fault currents in the phases. The paper exhibits the technique in ascertaining from the direct-current calculating board the zero, positive and negative phase sequence components of the dissymmetry.

grounded neutral and transformers is shown on this diagram as illustrated in Fig. 3a to 3k inclusive.

The reactance values of all transmission lines are to be shown on this zero-phase sequence diagram as three and one-half times the reactance used in the previous diagram. While this is only approximately correct, experience has shown that this method of determining the zero phase-sequence reactance of transmission lines is sufficiently accurate for most practical cases. The reactance of all current-limiting reactors is the same as for three-phase short-circuit current calculations, except when installed in the neutral.

As in the previous set-up, the numbers in the upper half of the circles represent the numbers of the rheostats on the calculating board used for representing the equipment, and the numbers in the lower half of the circle are the reactances of the equipment, all reactance values being expressed on a common base. The same rheostat numbers are used for all transmission lines as were used for the same lines in the previous set-up.

The network represented by this zero-sequence diagram may now be set up on the calculating board. All the sources of ground current are connected to the positive or generator bus on the calculating board, and the rest of the network set-up is in accordance with the rheostat numbers shown on the diagram. Now, instead of connecting the negative bus on the calculating board to the network at the point of fault or short circuit as is done when determining three-phase short-circuit currents, one end of a spare rheostat—that is, a rheostat which has not been used for this zero sequence set-up—is connected to the network at the point of fault, and the other end of this rheostat is connected to the negative bus, thus placing the zero sequence network and this rheostat in series between the positive and negative buses on the calculating board. This is illustrated on the zero phase-sequence diagram shown in Fig. 5b, the rheostat shown dotted representing this spare rheostat. The same rheostat may be used for all the fault locations being considered by moving its connections from one fault location to another as readings are being taken. The setting of this rheostat is changed for each fault location for which readings are taken in accordance with the following instructions: Divide the total short-circuit kva. obtained for a three-phase fault at the single-phase-to-ground fault location under consideration into the kva. base of the study. The value thus obtained when multiplied by two is the setting for the rheostat.

For example, consider the case of a short circuit at point No. 1, Fig. 5b. The total short-circuit kva. for a three-phase short circuit at No. 1 is 350,000, as determined by the readings taken for the three-phase set-up. This divided into 50,000 kva., or the base kva., equals 14.5 per cent reactance, which is the total equivalent system reactance from the point of fault to all sources of generation for a three-phase short circuit at No. 1. This multiplied by two gives 28.6 per cent reactance, which is the proper setting for the rheostat. This procedure must be followed for each fault location considered, making sure that not only is the rheostat setting changed for each fault location in accordance with the instructions given above, but also that the rheostat is always connected between the point of fault under consideration in the zero-sequence network and the negative bus. The negative bus on the calculating board must not be connected directly to the network at the assumed point of short circuit but only through this rheostat. After setting and connecting the rheostats in accordance with the above instructions, desired readings may be taken of total current in the fault and in the branches of the network. The values of current obtained in the fault and in the branches of the network when the network is connected up in accordance with the instructions given above are to the zero phase-sequence components of the current in the conductors or fault. These components are shown in Fig. 1 as I_{AO}, I_{BO} and I_{CO} and as a group are one of the three components of current which make up the total current in the various conductors of the network for a single-phase-to-ground fault. This completes all the readings which it is necessary to take on the calculating board, since the value of the positive and negative phase-sequence components will be derived below from the readings already taken.

A tabular form is now prepared. The numbers of all

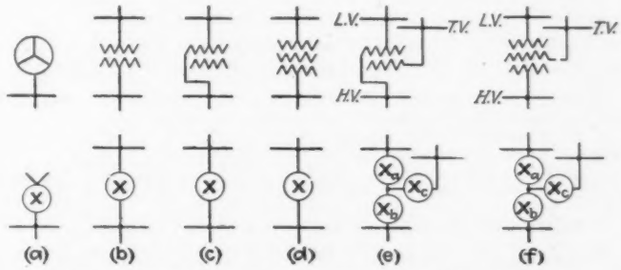

Fig. 2—Diagrammatic reactance for line apparatus

(a) Rotating synchronous apparatus. X = the leakage or sub-transient reactance, i.e., that which is used with the ordinary decrement curves.

(b) Two-winding transformers (see Fig. 2b). X = the reactance between the two windings.

(c) Auto-transformer with tertiary winding not connected to external circuits. X = the reactance between the series-common and common windings of the auto-transformers.

(d) Three-winding transformers with one winding not connected to external circuits. X = the reactance between the two windings which are connected to external circuits.

(e and f) Auto-transformers with tertiary leads brought out to external circuits and three-winding transformers with all windings brought out to external circuits

$$X_c = \frac{X_{HV-ter.} - X_{LV-ter.} - X_{HV-LV}}{2}$$

$$X_b = X_{HV-ter.} - X_c$$

$$X_a = X_{LV-ter.} - X_c$$

In which $X_{HV-ter.}$ is the reactance from the high-voltage winding to the tertiary winding, $X_{LV-ter.}$ is the reactance from the low-voltage winding to the tertiary winding and X_{HV-LV} is the reactance from the high-voltage winding to the low-voltage winding.

the faults and the numbers of rheostats through which readings of current were taken for each fault are listed in column No. 1 as shown. In column No. 2 is shown the total current in the faults and also in the branches of the network for three-phase short circuits at the locations listed in column No. 1. The term "total current in the fault" for a three-phase fault as used in the form is intended to mean the sum of the currents in one of the phases of all of the branches of the network feeding into the short circuit. This value is usually obtained directly on the calculating board, but can be obtained by adding all the branch currents feeding into the fault. Thus, in the case of a short circuit at No. 1 the total current in the fault for a three-phase fault equals the sum of the branch currents in rheostats Nos. 7, 17 and 20. In column No. 3 are shown the zero phase-sequence components of the total current in the faults and also in the branches of the network for single-phase-to-ground short circuits at the locations listed in column No. 1. When the zero phase-sequence component current flows in the opposite direction to the three-phase short circuit current in the same branch of the network for the same fault location, the direction of flow of the zero phase-sequence component current is to be assumed as negative and so indicated on the form. The current values listed in columns No. 2 and No. 3 are to be given in amperes and are determined by multiplying the calculating-board readings by the proper constant to given amperes at the voltages of the different branches.

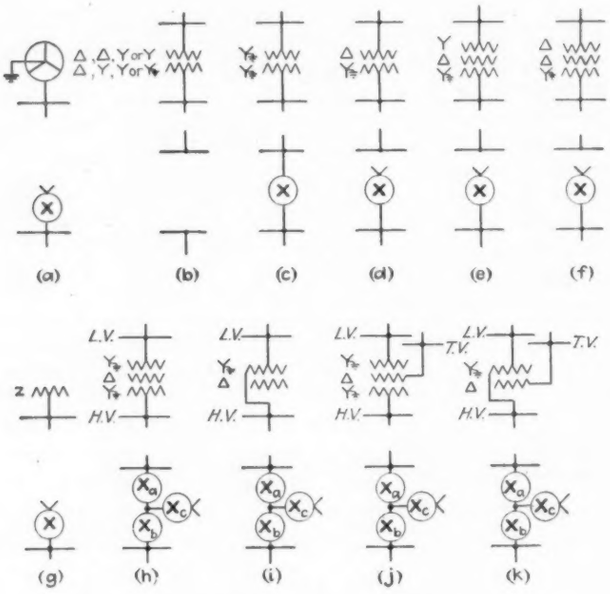

Fig. 3—Schematic representation for single-phase faults

(a) Rotating synchronous apparatus. The reactance to be placed in the circles on this diagram is not the reactance used in the previous diagram, but is a value of reactance known as the zero phase-sequence reactance. This reactance can be obtained from the manufacturer of the equipment, or an approximate value can be assumed as 27 per cent of the value used above for determining the three-phase short-circuit current values. No rotating apparatus with ungrounded neutral should be shown on this diagram.

(b) Delta-delta, delta—Y, Y—Y transformers with neutrals not grounded and Y—Y transformers with only one neutral grounded. Since no ground current can pass through any of these transformers, nor can any of these transformers be a source of ground current, they should not be shown on this diagram.

(c) Y—Y transformers with both windings grounded. These transformers cannot be a source of ground current, but ground current can pass through the transformers. X = the reactance between the two windings.

(d) Delta—Y transformers with neutral grounded. X = the reactance between the two windings.

(e) Y-delta-Y transformers with one neutral grounded. Ground currents cannot pass through these transformers, but the winding with the grounded neutral and the delta winding are a source of ground current. X = the reactance between the grounded-Y-connected winding and the delta-connected winding.

(f) Delta-delta-Y transformer with neutral grounded. X = the reactance between each delta winding and the Y windings paralleled.

(g) Zigzag grounding transformers. X = the reactance between the two windings.

(h) (i) (j) (k) Y-Y transformers with both neutrals grounded and delta tertiary winding and auto-transformers with neutral grounded and with tertiary winding. X_a, X_b, and X_c are determined in exactly the same manner as X_a, X_b and X_c were determined above for Figs. 2e and 2f.

Systematic Computation of Ground Current from Board Indications of Symmetrical Components

	Three-Phase Fault, Amp.	Single Phase-to-Ground Fault — Zero Phase-Sequence Component, Amp.	Positive and Negative Phase-Sequence Component, Amp.	Current in Faulty Conductor, Amp.	Current in Good Conductor, Amp.	Residual or Ground Current, Amp.
Total in fault No. 1	1,850	727	727	.....	.....	2,181
In rheostat No. 3	2,050	0	805	1,610	—805	0
In rheostat No. 5	332	34	135	304	—101	302
In rheostat No. 6	1,540	0	726	1,452	—726	0
In rheostat No. 7	615	63	242	547	—179	189
In rheostat No. 8	106	29	42	113	—13	87
In rheostat No. 9	106	34	42	118	—8	102
In rheostat No. 13	905	165	353	871	—188	495
In rheostat No. 14	44	0	18	36	—18	0
In rheostat No. 17	695	100	273	646	—173	300
In rheostat No. 18	915	68	360	788	—292	204
In rheostat No. 20	556	565	218	1,001	—347	1,695
Total in fault No. 2	34,220	15,100	15,100	.....	.....	45,300
Total in fault No. 1	30,060	14,860	13,300	41,460	1,560	44,601
Total in fault No. 2	2,410	137	1,065	2,267	—928	410
Total in fault No. 4	1,750	103	773	1,649	—670	300
Total in fault No. 3	25,300	10,500	10,500	.....	.....	31,500
In rheostat No. 10	16,000	10,500	6,650	23,800	3,850	31,506

Converting to positive and negative components

We are now ready to determine the positive and negative phase-sequence components of the current. It can be proved mathematically by the method of symmetrical components that for a single-phase-to-ground fault the positive, negative and zero phase-sequence components of the total current in the fault are equal. Therefore the positive and negative phase-sequence components of the total current in each fault can be set down in column No. 4 equal to the zero phase-sequence component of the total current for the same fault as shown in column No. 3. It can also be proved that the distribution of positive and negative phase-sequence components of current in the branches of the network for a phase-to-ground fault is proportional to the distribution of current in the same branches of the network for a three-phase fault at the same location. The positive and negative phase-sequence component amperes of current in the various branches of the network listed in column No. 1 may therefore be determined by proportion as follows: For any phase-to-ground fault listed in column No. 1 the positive and negative phase-sequence component amperes of current in any of the branches of the network are equal to the currents in the same branch of the network for a three-phase fault at the same location times the total zero phase-sequence component of

current in the phase-to-ground fault divided by the total current in the fault for the three-phase fault; or, expressed in another way:

$$\text{Branch current in col. 4} = \frac{\text{Branch current in col. 2} \times \text{total current in col. 3}}{\text{Total current in col. 2}}$$

The total current in the grounded phase of all of the branches of the network listed in column No. 1 for a single-phase-to-ground fault is equal to the sum of the positive, negative and zero phase-sequence components of current in the branches of the network, or the value in column No. 3 twice the value (algebraic) in column No. 4.

The total current in the good or non-grounded phase is equal to the value in column No. 4 minus the value (algebraic) in column No. 3.

The residual or ground current equals three times the zero phase-sequence component, or three times the value given in column No. 3.

Representative example of the process

As an example consider the case of a phase-to-ground short circuit at No. 1: The total current in the fault for a three-phase fault is 1,850 amp. and for a single-phase-to-ground fault 727 amp. The current in the branch of the network represented by rheostat No. 7 for a three-phase fault is given in column No. 2 as 615 amp., and the zero-phase sequence component of current through the same branch of the network for the single-phase-to-ground fault is given in column No. 3 as 63 amp. From the discussion given above the positive and negative phase-sequence component amperes of total current in the fault are each equal to the zero phase-sequence component amperes of total current in the same fault, or 727 amp. The positive and negative phase-sequence component amperes of current in the branch of the network represented by the rheostat No. 7, according to the above instructions, equal $(615 \times 727) \div 1{,}850 = 242$ amp., and the current in the grounded phase of that branch of the network equals twice 242 amp. + 63 amp., or 547 amp. The current in the good or non-grounded conductor equals 62 amp. —242 amp. or —179 amp. The current in the other branches of the network have been determined in the same manner as for the illustration above.

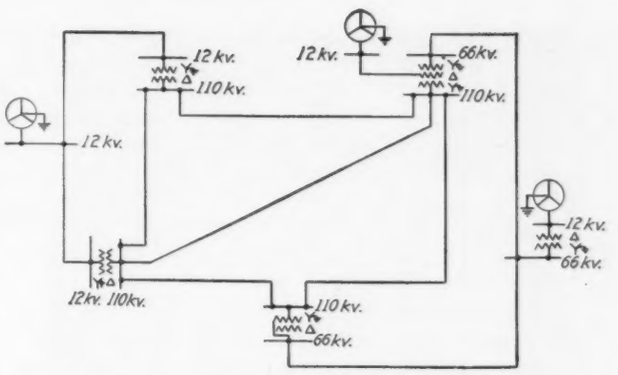

Fig. 4—Network of three stations and eight lines

It has been assumed in the above method of determining single-phase-to-ground short-circuit currents that the positive and negative phase-sequence components are equal and also that the positive, negative and zero phase-sequence components are in phase and may therefore be added algebraically instead of vectorially. While these assumptions are not strictly correct, they are accurate for most practical cases to so great a degree that the error introduced in the final results is not appreciable.

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I.E.S. Lighting Data Sheets

The Illuminating Engineering Society has completed its first series of lighting data sheets, 48 in number, and is ready to start on the second series, J. C. Fisher, chairman of the committee on lighting service, 29 West Thirty-ninth Street, New York, announces in soliciting subscriptions. Information very helpful to lighting engineers is contained in these sheets, which give illustrated particulars of the type of units and the proper layout of equipment to solve stated lighting problems of varied kinds, including those concerned with factories, auditoriums, exteriors and so forth.

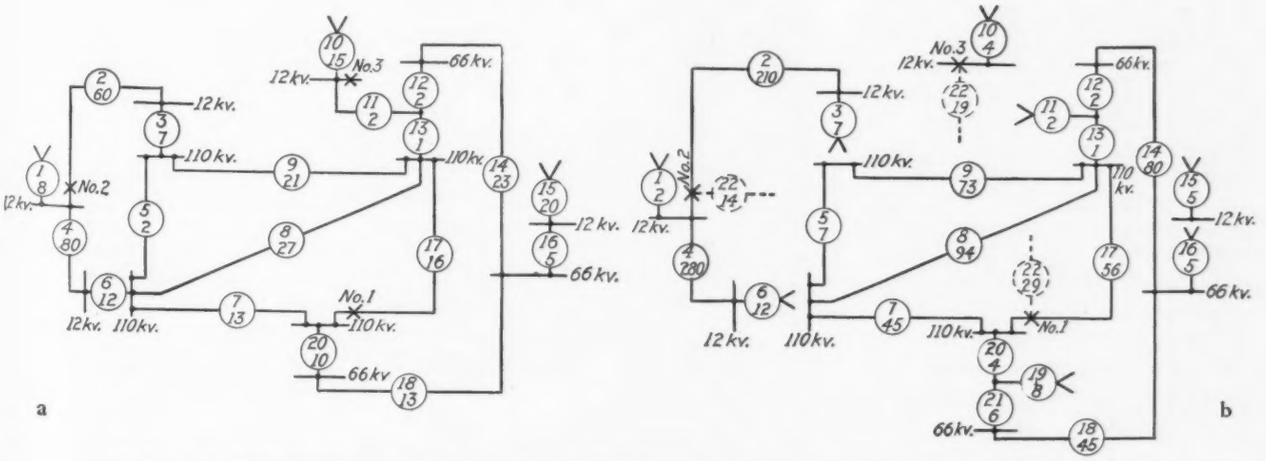
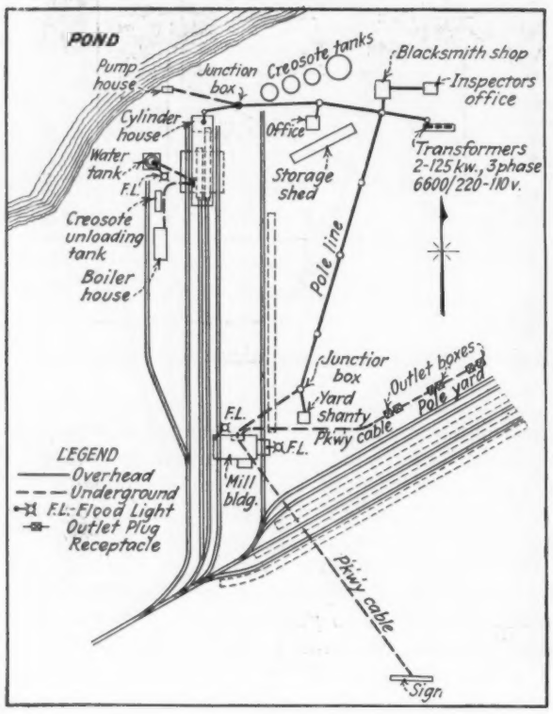


Fig. 5—(a) Calculating-board diagram for zero phase-sequence component in network of Fig. 4. (b) Sections in which no ground current can flow are isolated from the board set-up

Electric Drive Simplifies Wood Tr

—Machinery units subdivided.
—Working spaces kept clear.
—Fire hazards minimized.



General layout of treating plant

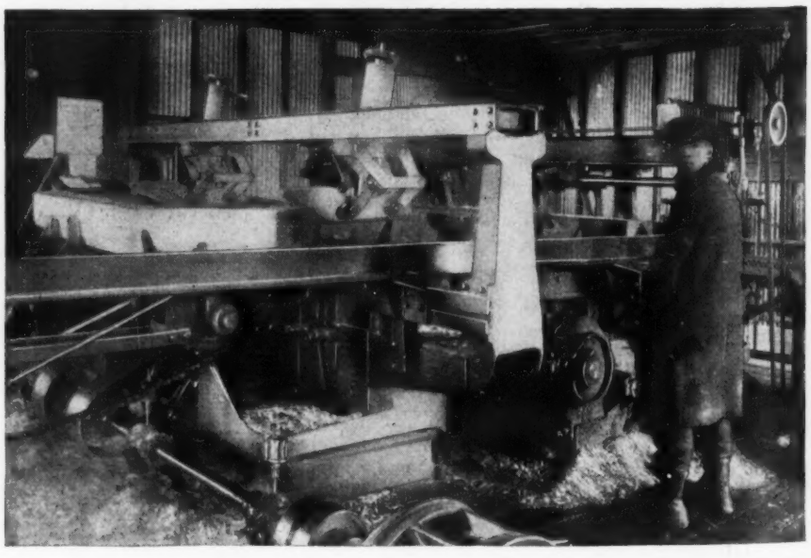
Underground circuits are utilized where trackage serves handling equipment.

ADVANTAGES of individual motor drives in an establishment where various processes are distributed over a considerable area are well illustrated in the Montan Treating Company's new process plant for wood preservation at Westboro, Mass. Aside from railroad ties, the major products treated at this plant are poles and crossarms, for which a new "non-bleeding" treatment has been developed, utilizing a solution of "montan" wax and creosote oil as the preservative. A pole yard and several thousand feet of trackage permit the storage and handling of the material brought in and processed. Rapid handling of material with minimum fire risk and flexible machinery service are attained by the use of 243 hp. in connected motor load subdivided into units ranging from fractional horsepower ratings up to 100 hp. The ample clearances vital in handling timber speedily are secured by the use of individual motor drives and by installing local distribution circuits overhead where space allows and in parkway cable for runs adjacent to tracks.

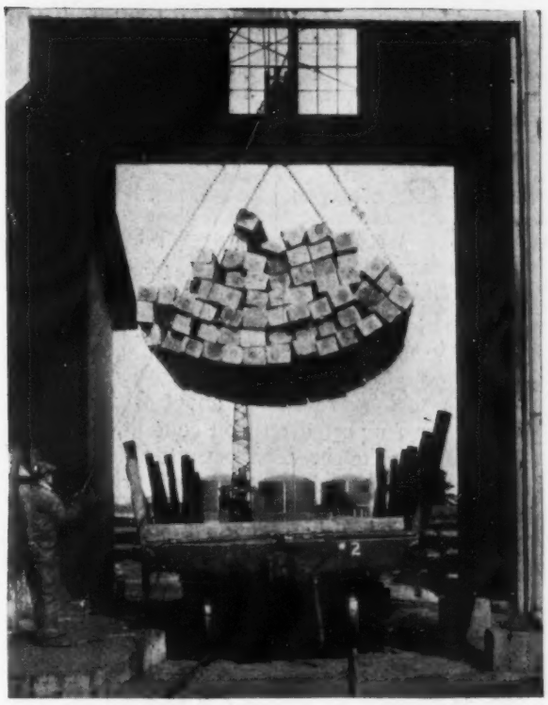
The plant includes a main or "cylinder" building where the materials are subjected to treatment in two large retorts of cylindrical shape, the larger being 100 ft. long and 8 ft. in diameter. There is also a mill building for adzing and boring railroad ties, a boiler house where process steam is generated and a spacious pole yard provided with tracks for handling the heavy timbers with a locomotive crane and equipped with power receptacles for plugging in portable power drills and gainers.

An essential element of the treating process is the application of air pressure to the material both before and during the treatment with preservative compound. The transportation of oil from the unloading tank to the storage tanks is done most effectively by compressed air. This plant requires a 100-hp. electrically driven air compressor. This machine operates intermittently and must be ready for service on short notice. When started, every precaution must be taken to avoid any interruption in the operation of the air compressor in order to insure a continuous cycle of treating operations.

In the mill building electrical energy is used in handling the ties and in the automatic machine which cuts the flats and drills holes for rail spikes. An exhaust fan which collects the dust and shavings from the machine in the



Automatic adzing and boring machine driven by 55 hp. in motors



14-hp. electric hoist delivering 7 tons of ties to boring plant. This outfit also has a 5-hp. traverse motor for spotting the load into the mill

d Treating Plant Operations

mill building and transmits them to the boiler house is driven by a 25-hp. motor, the tie borer being run by another 25-hp. motor and the adzer by a 30-hp. motor. These motors are all remote controlled through push buttons which operate starting compensators, the power circuits being protected by individual fused safety switches.

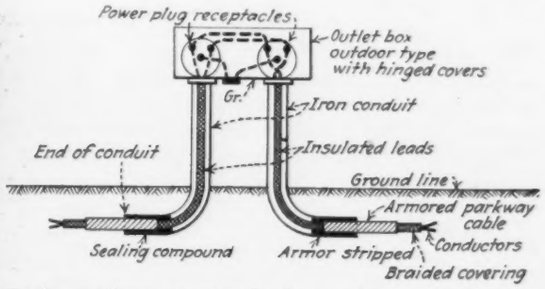
A 5-hp. motor fan aids the transmission of wood dust and shavings through the 250-ft. length of pipe between the two buildings. Water pressure for the process and for miscellaneous use is provided by a steel tank, to which the supply is delivered by a 25-hp. motor-driven pump on the shore of a large pond. The lighting load includes three 1,000-watt floodlights, an electric sign and outlets for general illumination in the various buildings.

A record extending over two years shows an average consumption of 0.1312 kw. hour per cubic foot of wood treated, resulting in an average cost of power per cubic foot of 4 mills. The energy consumption per cubic foot of ties put through the mill averages 0.077 kw-hr., with an average cost of 2.3 mills per cubic foot. The energy consumption per tie handled is 0.264 kw.-hr., with an average energy cost per tie of 8 mills.

Aside from this low cost of power, an important advantage is gained through supply from the Marlboro Electric Company, which is tied into the large network of the New England Power Association. Even if this plant generated its own power it would have been necessary to bring in a standby line from the power system. The cost of this standby service would offset any economies which might have been obtained from an isolated plant.

On account of the danger of interference with overhead wires from material-handling equipment in the plant it was necessary to run a large part of the distribution underground, as indicated in the general layout of the plant. This was done by use of parkway cables. At the pole yard these cables pass through a number of

Motor-driven drills and gainers in pole yard are served by heavy-duty cable from outdoor receptacles



Each outdoor receptacle has twin power outlets and through connections to the underground cable system

Motor-Driven Equipment at Montan Treating Plant

Total connected load approximately 243 hp.

	Motors, Hp.		Motors, Hp.
Blacksmith Shop		Tool room	3
Small planer	1½	Compressor	½
Laboratory		Boiler House	
1 small electric oven		Stack draft	5
Adzing and Boring Mill		Pump House	
Tie borer	25	Water pump	25
Exhauster fan	25	Treating House	
Adzer	30	Air compressor	100
Hoist	14	Wax conveyor	2
Hoist	5	Preservative pump	3

Yard

1 Portable pole gainer — 3 Portable electric drills — 3 Floodlights
1 Tool grinder (yard shack) — Sign lighting

outlet boxes which are raised about 2 ft. above the ground and are supported on iron conduit, as shown on the accompanying sketch. This permits a flexible method of connecting the portable gainer and drills at several points in the yard, as shown in the accompanying illustration. The run from the 250-kva. supply transformer bank to the principal buildings was laid out in the part of the yard clear from the tracks, and this part of the distribution is therefore carried by overhead construction on a pole line.

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READERS' FORUM

Another Claimant to Pioneer Synchronous Hog-Mill Drive

To the Editor of the ELECTRICAL WORLD:

On page 597 of your March 28 issue you publish a letter from S. P. Bordeau of the Electric Machinery Manufacturing Company, Minneapolis, Minn., who stated that in August, 1929, the Electric Machinery Manufacturing Company successfully applied a synchronous motor to a No. 25 CRSF Mitts & Merrill hog at the Packard Motor Car Company plant, Detroit, Mich., and also that this installation was the first application of a synchronous motor to a hog for reducing wood.

The records of the Wagner Electric Corporation show that in December, 1925, we shipped two 150-hp., 900-r.p.m. Fynn-Weichsel synchronous motors to an automobile body plant and that in March, 1926, a check-up showed that these motors were driving wood hogs.

Hence, neither the General Electric Company nor the Electric Machinery Manufacturing Company was the first to apply synchronous motors to a hog mill. Incidentally, the Wagner Fynn-Weichsel (synchronous) motor is ideally suited for hog mills, as it has the ability to carry very heavy overloads without stalling. Should an overload cause the motor to fall out of synchronism, it runs as a slip-ring motor, and as soon as the excess overload is removed the motor again automatically resumes synchronous speed. No special control equipment is required; the motor itself has the necessary characteristics to return to synchronous speed.

C. B. DIETRICH,
Advertising Manager.
Wagner Electric Corporation,
6400 Plymouth Avenue, St. Louis, Mo.

Electric and Natural Gas Transmission Not Comparable

To the Editor of the ELECTRICAL WORLD:

In the May 9, 1931, issue of the ELECTRICAL WORLD there is an editorial entitled "Are Transmission Lines in Natural Gas Areas Outmoded?" This editorial draws some sweeping and unwarranted conclusions based on an article which appeared in a previous issue entitled "Gas Transmission Costs One-Third of Electricity," written by Claude C. Brown, chief gas and electrical engineer Railroad Commission, State of California.

The article simply shows, without drawing any conclusions, that B.t.u. can be transmitted over a gas pipe line at much less cost than over a transmission line, the ratio, of course, being, roughly, three to one. It is clear that in the article this was pointed out merely as a matter of interest and no great emphasis was laid on it as an economic matter. In the editorial, however, it is taken up quite seriously as being of great economic importance and the comparisons are drawn between electrical transmission and transmission of energy over a gas line as if the two services are comparable.

It is quite evident that the two cases of transmission of energy are not in any way comparable for the reason that the gas energy, after it has been transmitted, must be converted into electrical energy and the highest efficiency for this conversion in modern high-pressure steam plants is of the order of 28 per cent. This would mean that, in the case of the gas transmission, instead of the cost of transmission per million horsepower-hours being $65 it would be approximately $230, as compared with $190 for transmitting the same amount of energy electrically; that is to say, the cost of transmitting the required amount of fuel energy over the gas lines for conversion into electrical energy is approximately 20 per cent higher than the cost of transmitting the same electrical energy over transmission lines.

As regards the question of reliability, the record of some of the more recent 220-kv. lines in the battle against outages due to lightning may be of interest. The number of outages per 100 miles per year is of the order of two, which cannot be considered very serious. Moreover, the greater knowledge of lightning phenomena obtained as a result of the last three or four years of intensive study in laboratory and field indicates that this outage record can be still further decreased. Even when such an outage takes place its duration is usually not more than one or two minutes, and in most cases where the system has been designed to insure stability there is no interruption in the service.

While I believe that gas piped over considerable distances will be an important economic factor in the electrical industry, it will not be by reason of alleged advantages in cost of transmitting B.t.u., but by reason of the flexibility of gas as a fuel for standby units to supply power for emergency and peak loads, since it can be stored in large tanks at little cost. Thus a city can be supplied with base power over a line operating at high load factor, the peak or emergency loads being taken care of by using stored gas.

CHARLES FORTESCUE,
Consulting Transmission Engineer.
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

Men of the Industry

W. C. Morse New Superintendent in Seattle

W. CHESTER MORSE, consulting engineer, who served as city engineer of Seattle, Wash., during 1927 and 1928, has been named to succeed J. D. Ross as superintendent of Seattle's Lighting

Department. The appointment was made by Mayor Frank Edwards and was the second in a succession of five appointees named by the Mayor and tentatively rejected by the City Council during a protracted struggle to bring about the reinstatement of Mr. Ross. Mr. Morse was confirmed by a five-to-four vote of the Council.

Mr. Morse has been a resident of Seattle since 1882. In 1908 he started in private engineering practice in Seattle, and since that time he has planned and supervised the construction of numerous water systems. For two years he was chief engineer of the Puget Sound Bridge & Dredging Company in charge of hydraulic projects. In 1916 he enlisted in the National Guard, Coast Artillery Reserve. In the World War he served for nineteen months in the 50th Heavy Artillery and was discharged with the rank of major. A member of the American Society of Civil Engineers, Mr. Morse has been engaged in private practice since his retirement as city engineer of Seattle.

Commenting on his appointment as head of the City Lighting Department, Mr. Morse said: "I am a firm believer in municipal ownership of public utilities, at least so far as power and light are concerned, and it will be my endeavor to make the city light department pay dividends to the people of Seattle. The only way this can be done is by reducing rates. I am not saying I can do this right away, for 1932 will see the peak drain on the department bond redemption and interest payments."

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J. C. McQuiston, Retiring Westinghouse Official

J. C. MCQUISTON, whose retirement as general advertising manager of the Westinghouse Electric & Manufacturing Company was announced in the May 30 issue of the ELECTRICAL WORLD, is today one of the most widely known advertising men in the United States. Few men have had a broader experience in the many forms of advertising which have been employed during the past 25 years, and this background has enabled him to keep the advertising of his company in step with the rapid development of the electrical industry. Mr. McQuiston holds membership in many organizations devoted to the interests of the electrical industry and of advertising. He is a past-president of the Association of National Advertisers and has three times been president of the Pittsburgh Advertising Club. For many years he has been prominent in committee work in

the National Electric Light Association, the Pennsylvania Electric Association and the American Electric Railway Association.

Mr. McQuiston has been identified with the Westinghouse advertising and publicity department since the year 1897 and he has had complete charge of it since 1902.

N. T. Wilcox Enters the Water-Heating Field

NORMAN T. WILCOX resigned from the Stone & Webster Service Corporation on June 1 to take charge in New England of the water-heating equipment sales of the Hynes & Cox Electric Com-

pany, Albany, N. Y. His headquarters will be at Boston, Mass. Mr. Wilcox is known throughout the industry for his constructive work in commercial lines. He is a past-chairman of the Commercial National Section of the National Electric Light Association and at present heads the national water heating committee of that organization. He is a fellow of the American Institute of Electrical Engineers, and has been active in the N.E.L.A. for many years, having also served as chairman of the power sales and electric refrigeration committees. His early career included work for the General Electric Company and with power companies in New York state, the South and West.

Mr. Wilcox's Stone & Webster affiliations cover a wide range of activities, including the former management of properties at Lowell, Brockton and Pawtucket, sales managership of the Mississippi River Power Company, Keokuk, Iowa, and in 1923 he was transferred to Boston to assist in the development of sales organization and policies for Stone & Webster. In 1928 he organized the national water-heating committee of the N.E.L.A., starting the country-wide surveys and analyses which have resulted in a revealing and stimulating report on this subject soon to be released. Mr. Wilcox's contribu-

tions to systematic and economic load-building practice have given him an outstanding reputation, and his championship of heavy-duty service and long-range scheduling in domestic utility business, in association with Davis M. Debard of Stone & Webster, has influenced not only these properties but many others in the direction of planned expansion based on market analysis.

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J. S. Tritle Westinghouse Executive

J. S. TRITLE, who was elected vice-president and general manager in charge of manufacturing, sales and engineering operations of the Westinghouse Electric

& Manufacturing Company, as announced in the May 30 issue of the ELECTRICAL WORLD, spent eight years in the electrical engineering contracting business before becoming manager of the Kansas City district for the Westinghouse company. In 1915 the St. Louis and Kansas City offices were consolidated, Mr. Tritle assuming charge of both. In 1922 he was made manager of the merchandising division of the general sales department of the company. Three years later, when a separate department was made of the merchandising business, Mr. Tritle was made general manager of the merchandising department, overseeing engineering and manufacturing, as well as sales work, with headquarters in Mansfield, Ohio. From Mansfield he was moved to East Pittsburgh on May 1, 1929, as vice-president in charge of manufacturing operations.

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FREDERICK M. FEIKER, formerly a member of the staff of the McGraw-Hill Publishing Company, Inc., has been designated by President Hoover as director of the Bureau of Foreign and Domestic Commerce. Mr. Feiker is best known for his work, extending over a period of eight years, as an editor and later as editorial director and vice-president of the McGraw-Hill company. In 1921, shortly after Mr. Hoover became Secretary of Commerce, the McGraw-Hill company acceded to his request to lend him the services of Mr. Feiker for the purpose of developing the contacts of the Department of Commerce with business and trade. Even after returning to his editorial duties Mr. Feiker continued to serve the department in an advisory capacity. For the past four years Mr. Feiker has been managing director of the Associated Business Papers and in that position he promoted closer relationships between the business press and the government.

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T. B. Wilson Heads Louisville Utility

T. B. WILSON, vice-president and general manager of the Louisville Gas & Electric Company since 1924, has been elected president of that company. His first connection with the electric industry was in 1896, when he was employed by the Citizens General Electric Company, one of the predecessors of the Louisville Gas & Electric Company, in one of its generating stations. In 1905 he was elected secretary and treasurer of the Louisville Lighting Company, and when this company, together with other electric utilities of Louisville, was merged into the Louisville Gas & Electric Company in 1913, he became treasurer and assistant secretary of the company. In 1915 he was appointed assistant general manager, in addition to his duties as secretary and

treasurer of the company, which position he held until 1924, when he was elected vice-president and general manager.

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JAMES D. ROSS, until recently superintendent of the Seattle municipal electric light and power system, has been retained to advise the Power Authority of the State of New York on certain technical phases of the St. Lawrence hydro-electric problem. Mr. Ross was removed from his position early this year by Mayor Frank Edwards, as an incident in the political fight over the Skagit River hydro project. Details of his engineering career were published in the ELECTRICAL WORLD March 21.

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OBITUARY

CHARLES C. ELWELL, a member of the Public Utilities Commission of Connecticut and prominent civil engineer on governmental and railroad projects, died May 21, in New Haven, at the age of 74. Mr. Elwell was in public office for the State of Connecticut for almost twenty years, first as engineer for the Public Utilities Commission and then as commissioner. He was born in Belfast, Me., and was graduated from the University of Maine. He had extensive railroad and railway experience before joining the Public Utilities Commission in 1911.

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EDWARD H. PALMER, prominently identified with the public utility industry in New York State, died May 20, in Geneva, after an illness of ten days. Mr. Palmer was 79 years of age. In his 35 years of business activity in Geneva he organized the Empire Gas & Electric Company and directed the operation of many other companies. He had served as president of the Empire Gas & Electric, chairman of the board of directors of the National Bank of Geneva, head of the Geneva Preserving Company, the Geneva Cutlery Company and the Empire Can Company. Mr. Palmer was born in Clinton, Ohio, May 17, 1855, and spent his early life in the Middle West. He was graduated from Cornell University in the class of 1877. Realizing that only through a combined force could the smaller utility companies be a successful enterprise he built around the Empire Gas & Electric Company an organization of smaller companies in this up-state district that 25 years later attracted the attention of New York financiers. Associated with him were companies in Auburn, Seneca Falls and other places and the Central New York Electric Company. In 1925 this organization was sold to the Phillips and Olmstead interests and two years ago to the Associated Gas & Electric Company. For a time Mr. Palmer remained as chairman of the board, but in 1928 he resigned his business connections.

Financial and Statistical News

NEW financing has been unusually active at intervals this year to date, setting up a total of $870,000,000, against $558,107,500 for the same period last year. The market for first-grade bonds continues strong. Further financing to come into the market shortly is said to include around $50,000,000 for Jersey Central Power & Light and Safe Harbor Water Power. A fair volume of refunding remains to be carried out.

——PUBLIC UTILITY COMMON STOCKS SEEM TEMPORARILY to have succeeded the railroad stocks as selling targets and several issues were selling close to a 6 per cent yield basis prior to the turn Tuesday. The ELECTRICAL WORLD index of 37 power and light common stocks is now 56.7, against 59 last week and a high of 74 for the year.

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Stocks Drop Another Billion

APART UTTERLY FROM ANY relation to earnings, prospects or property values, utility stocks continue to swing down to new lows. This week's selling—distress, panic or short, or all three together—has left many seasoned issues back at 1926 levels as of June 3.

Looking over some current quotations and comparable 1929 highs does not inspire much respect for the public's ability to judge values. American & Foreign Power, for example, was 199 and is now about 22. American Power & Light was considered worth 175, now 32. North American was 186, is 60. Standard Gas & Electric was "worth" 243, but is now "worth" 56.

Last month's selling offers another picture. Without the slightest change, unless for the better, in the utility outlook, the public lopped nearly a billion from the face value of the industry's common stocks.

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Energy Production Points Toward Recovery

REPORTS OF ELECTRICAL ENERGY production by the United States Geological Survey seem to indicate a tendency toward recovery in the demand. April output, 7,656,739,000 kw.-hr., was only 4 per cent less than in 1930, whereas the January output was 8 per cent less and the February output 6 per cent less.

The average daily production for the first four months shows little, if any, of the usual seasonal decrease, whereas in 1930 it fell off 4 per cent from January to April. Based on the eleven years of record from 1920 to 1930 the average daily production in April is normally about 3 per cent less than in January.

Output from water power shows a marked increase from March to April, 22 per cent for the United States as a whole. The output in April was 41 per cent of the total, which is comparable with 34 per cent in March. This increase, due to the more nearly normal precipitation in April, produced a decrease in the output from fuels. The latter fell from 5,244,117,000 kw.-hr. to 4,544,186,000 kw.-hr. Fuel consumption decreased correspondingly; the 2,980,966 tons of coal in April was about 430,000 tons less than the amount used in March.

The statistics here quoted apply to all electric utilities, and not merely to central stations, which produce about 94 per cent of the total.

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Atlantic Public Utilities Reorganize

THE REORGANIZATION PLAN of the Atlantic Public Utilities, Inc., and subsidiaries has been declared operative and will be put into effect by July 15. It is understood to be sponsored by the Insull interests, which have agreed to purchase the senior issue of bonds and the equity stock of the new companies to be organized.

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Security Values Should Be 1⅓ Times Property Values

"POWER and light common stocks can logically sell at a level which would give the aggregate of all securities a value about one-third greater than the property values." This is the opinion given to the ELECTRICAL WORLD by an officer of one of America's largest investing institutions. It is an investment rule followed by that institution and should be of interest not only from the investment angle but from the standpoint of the utility executive who must consider the relationship between existing equities and capital structures.

With market quotations 60 to 70 per cent lower than they were twenty months ago, there is a natural attempt to seek some reliable gage of real values. Earnings of many utilities are about where they were two years ago, yet stocks which sold as high as 30 times per share earnings then are now around twelve to fourteen times earnings. They had a yield under 2 per cent—now nearer 6.

Inability to depend on the ratio of earnings to sales price suggests a consideration of their relation to true property values. The ratio adopted by the institution referred to above, while arbitrary, is found to be based on experience. It states that, taking bonds at par, the market value of all securities should be around 1⅓ times physical value of plant and equipment, or 6⅔ times gross revenue. Or, putting the same rule in reverse, gross revenue should be about 15 per cent of the market value of all securities. The ratios are the result of experience in respect to normal annual growth of the industry as a whole.

Now below real values

Assuming the capitalization of the power and light industry to be approximately $12,000,000,000 today, the market value of securities could reasonably be in the neighborhood of $16,000,000,000. Recent liquidation, however, has brought common stocks down from their unwarranted 1929 levels to levels which would appear to be far below real values, at least on the basis of the ratio presented above. Based on a study of a number of representative companies, security values are now about on a par with property values instead of 1⅓ times values and about five times rather than 6⅔ times gross earnings.

The liquidation has brought common stocks down to about thirteen times indicated 1931 earnings. Investment authorities generally agree that these stocks would be warranted in gradually stabilizing somewhere between sixteen and twenty times earnings, after the current orgy of selling has subsided and the public once more begins to think of values rather than being impelled by mob instinct to sell issues at prices which have no relation to values.

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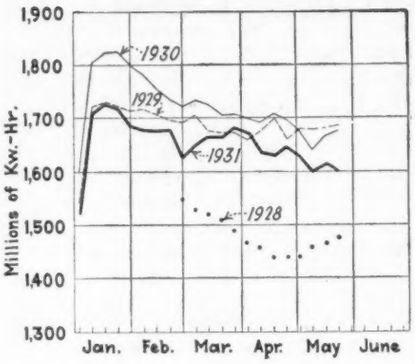
Middle West Adds Many New Industries

NEW INDUSTRIES ESTABLISHED during 1930 in the territories served by the Middle West Utilities System will use more than $1,000,000 worth of power annually, according to a compilation prepared by John B. Reynolds, the company's vice-president in charge of industrial development.

"There is a growing tendency of manufacturers to establish small auxiliary plants, and to locate them in small communities where the penalties of congestion and high metropolitan costs may be avoided," Mr. Reynolds said. "As the Middle West Utilities System's territory is almost entirely non-metropolitan in character, it benefits to a marked degree from this trend of industrial development."

The establishment or expansion of industries during 1930 in the communities served resulted in the employment of 18,000 additional people, with an estimated payroll increase of about $14,000,000 per year. The addition of this purchasing power strongly stimulates the communities served and is reflected in both the domestic and industrial use of the system's services.

Weekly Energy Output



OUTPUT OF ELECTRIC light and power companies in the United States, as estimated by the statistical research department of the National Electric Light Association, is shown in the accompanying table for recent weeks and corresponding periods in preceding years:

	Millions of Kw.-Hr.			
Week ended	1931	1930	1929	1928
May 2	1,622	1,672	1,673	1,440
May 9	1,600	1,640	1,677	1,460
May 16	1,614	1,669	1,680	1,470
May 23	1,600	1,673	1,687	1,480
May 30	1,565	1,627	1,606	1,370

Along the Atlantic seaboard the output has lately been averaging 2 or 3 per cent greater than last year; gains on the Pacific Coast were about the same, while the central industrial region has shown a decrease usually hovering around 7 per cent.

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Residential Customers Save Two Millions

NEARLY TWO MILLION DOLLARS was saved by residential customers of the Middle West Utilities System as a result of lower average rates for household electricity used in 1930. The average domestic rate per kilowatt-hour in 1930 was 6 per cent less than in 1929, according to F. E. Kruesi, vice-president of the company. This resulted in a total saving of $1,963,000 by the system's 968,926 domestic customers.

Improved generating efficiency, increased use by customers and economies resulting from interconnections have made these reductions possible, Mr. Kruesi said. Customers of every operating subsidiary, without exception, earned lower rates in 1930 than in 1929.

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Utility Issues Feature Market in May

DURING the month of May new offerings of electric service companies amounted to $189,415,000, as compared with $203,000,000 in April and $102,700,000 in May a year ago. This figure brings to a close the five-month period with a total of $778,729,000, as against $558,107,500 for the similar period of 1930.

Industrial financing slumped in May to $2,200,000, as against $219,138,000 for the similar period of 1930. Utility stock issues featured the May market, two sizable preferred offerings having been made. Attention is called to the prominence of refunding operations which were undertaken during the month under review. The average yield amounted to 4.67 per cent, as compared with 4.75 per cent in April.

New Security Issues of Electric Service Companies in May

Name of Company	Amount	Period (Years)	Class	Purpose	Interest Rate	Price	Per Cent Yield
Eastern Shore Public Service Co.	$1,250,000	25	First mortgage and first lien gold bonds, series B.	To reimburse company for cost of acquiring properties, for acquisition of properties and for the corporate purpose	5	92	5.60
New Jersey Power & Light Co.	6,000,000	29	First mortgage gold bonds.	To retire bonds to reimburse for property improvements and for other corporate purposes	4½	102	4.37
Central Power & Light Co.	2,500,000	25	First mortgage gold bonds.	To reimburse for expenditures on additions and for other corporate purposes	5	95½	5.47
Public Service Company of Oklahoma.	1,250,000	26	First mortgage gold bonds, series D.	To reimburse companies' treasury for the cost of extensions and additions to its property.	5	100½	*4.96
Consolidated Gas, Electric Light & Power Company of Baltimore	18,000,000	50	First refunding mortgage sinking fund gold bonds.	Refunding	4	93½	4.21
Dominion Gas & Electric Co.	8,000,000	14	First lien and collateral gold bonds	To purchase securities and for other corporate purposes	6½	96	6.90
Georgia Power & Light Co.	440,000	47	First mortgage gold bonds.		5	89	5.75
Gulf States Utilities Co.	2,500,000	30	First mortgage and refunding gold bonds, series B.	To retire floating debt incurred for capital expenditures and for other corporate purposes	4½	94	4.88
Metropolitan Edison Co.	5,000,000	40	First mortgage gold bonds, series E	General corporate purposes	4	95	4.26
Public Service Electric & Gas Co.	31,050,000	..	Cumulative preferred stock	To retire stock	5	103½	4.83
Puget Sound Power & Light Co.	16,000,000	..	First and refunding mortgage gold bonds, series D	To retire notes, for the discharge of obligations incurred for additions to plant and for other corporate purposes	4½	94½	4.95
Nebraska Power Co.	16,500,000	..	First mortgage gold bonds.	Refunding, to reimburse for expenditures on additions and for other corporate purposes.	4½	102½	4.37
Pennsylvania Electric Co.	6,000,000	40	First and refunding mortgage gold bonds	General corporate purposes	4	95½	4.24
Public Service Corp. of New Jersey	14,925,000	..	Cumulative preferred stock	Acquisition of stock and for general corporate purposes	5	99½	5.03
Consolidated Gas Co. of New York	60,000,000	20	Gold debenture bonds.	To discharge short-term obligations, reimburse for acquisition of stock and to acquire certain stocks	4½	101	4.40
				Rights			
Total	$189,415,000			Total financing for May	$188,559,975		
Total amount actually realized	188,559,975						

April Reports More Favorable

SLIGHTLY LARGER EARNINGS are shown by electric light and power companies thus far reporting for April this year than in 1930. Some have picked up materially; analysis taking into account the contrary movements in different sections indicates an increase of 0.5 per cent for the country as a whole, thereby bringing up the total from the $176,300,000 of last year to $177,200,000. Final returns are not expected to change the results materially.

This constitutes an upward movement compared with March, which fell slightly under last year's figures; the improvement was foreshadowed to some extent by the report on energy generated in March. The latter was closer to the corresponding output in the preceding year than that for any other recent month since September.

The favorable turn affected particularly the regions bordering on the Atlantic and Pacific seaboards. In both of these the increase over 1930 overshot that of March by a comfortable margin. In the Middle Atlantic states the final figures are expected to show a gain of 3 per cent or better, but the central industrial region lags somewhat behind last year's operations.

The average of kilowatt-hour sales was about the same as a year ago in New England, but losses, especially in the industrial sections—about 2 per cent in the Middle East and 5 per cent in the Midwestern industrial area—more than balanced gains in the Pacific states.

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General Public Service Omits Common Dividend

THE HALF-YEARLY DIVIDEND of 3 per cent on common stock payable in common stock has been omitted by the General Public Service Corporation. The regular quarterly dividends of $1.50 on the $6 preferred and $1.37½ on the $5.50 preferred were declared. Both are payable August 1.

General Public Service Corporation is an investment trust interested in public utility stocks and affiliated with the Stone & Webster group.

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NEWS BRIEFS

Cleveland Electric Illuminating Company has added Charles W. Mills to the board to succeed E. M. Bulkley.

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Stockholders of the Nova Scotia Light & Power Company, Ltd., at the recent annual meeting increased the authorized capitalization from 25,000 shares of 6 per cent preferred stock, par $100, and 40,000 shares of ordinary stock, no par value, to 50,000 shares of preferred and 50,000 shares of common.

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CURRENT EARNINGS REPORTS OF ELECTRIC LIGHT AND POWER COMPANIES

Operating Companies

	1931	1930	Per Cent Increase	Operating Ratio 1931	Operating Ratio 1930
Alabama Power & subs.* (Year ended March 31)					
Gross earnings	$17,927,216	$18,152,851	—1.2	43	39
Net earnings	10,286,007	10,991,315	—6.5	..	..
Blackstone Valley Gas & Electric & subs. (Year ended March 31)					
Gross earnings	6,340,041	6,618,662	—4.2	58	58
Net earnings	2,684,872	2,764,528	—2.9	..	..
Consumers Power (Year ended March 31)					
Gross earnings	32,187,396	33,339,669	—3.5	44	48
Net earnings	18,005,353	17,213,383	4.6	..	..
Galveston-Houston Electric & subs. (Year ended March 31)					
Gross earnings	4,570,633	5,171,041	—11.6	70	68
Net earnings	1,331,511	1,659,514	—12.0	..	..
Georgia Power & subs.† (Year ended March 31)					
Gross earnings	25,616,755	22,887,505	11.9	50	48
Net earnings	12,731,775	11,926,049	6.7	..	..
Kansas City Power & Light (Year ended March 31)					
Gross earnings	14,800,922	14,624,143	2.0	48	50
Net earnings	7,746,609	7,298,400	6.2	..	..
Louisville Gas & Electric (Year ended February 28)					
Gross earnings	10,607,993	10,378,370	2.2	..	..
Net earnings	5,546,692	5,322,397	4.2	..	..
Nevada-California Electric & subs. (Year ended March 31)					
Gross earnings	5,687,091	5,718,764	—0.5	48	49
Net earnings	2,964,988	2,924,042	1.4	..	..
Northern States Power (Year ended February 28)					
Gross earnings	33,302,796	32,866,880	1.3	..	..
Net earnings	16,622,970	16,808,269	—1.1	..	..
Northwestern Electric (Year ended February 28)					
Gross earnings	3,631,714	3,681,254	—1.0	60	59
Net earnings	1,437,505	1,491,319	—4.0	..	..
Ohio Edison (Year ended March 31)					
Gross earnings	19,094,517	19,442,541	—1.8	39	42
Net earnings	11,691,854	11,237,775	4.0	..	..
Oklahoma Gas & Electric (Year ended February 28)					
Gross earnings	13,821,479	14,354,809	—3.7	..	..
Net earnings	6,359,484	6,709,451	—5.2	..	..
San Diego Consolidated Gas & Electric (Year ended February 28)					
Gross earnings	7,425,918	7,276,921	2.0	..	..
Net earnings	3,785,646	3,467,747	9.2	..	..
Southern California Edison (Year ended March 31)					
Gross earnings	41,158,204	40,799,484	1.0	32	33
Net earnings	28,110,463	27,390,542	3.0	..	..
Tampa Electric & subs.‡ (Year ended March 31)					
Gross earnings	4,583,043	4,578,688	0.0	64	67
Net earnings	1,654,752	1,500,223	10.3	..	..

Operating Companies

	1931	1930	Per Cent Increase	Operating Ratio 1931	Operating Ratio 1930
Tennessee Electric Power & subs. (Year ended March 31)					
Gross earnings	14,367,741	15,113,361	—4.9	53	51
Net earnings	6,801,918	7,448,423	—8.7	..	..
Wisconsin Public Service (Year ended February 28)					
Gross earnings	5,562,899	5,565,539	—0.0	..	..
Net earnings	2,294,256	2,380,771	—3.6	..	..

Holding Companies

American Light & Traction & subs.‡ (Year ended March 31)					
Gross earnings	$42,991,201	$47,331,052	—9.3	72	71
Net earnings	11,950,577	13,522,054	—11.6	..	..
American Water Works & Electric & subs. (Year ended March 31)					
Gross earnings	53,090,329	54,688,149	—2.9	52	50
Net earnings	25,666,506	27,228,847	—5.7	..	..
Commonwealth & Southern & subs. (Year ended March 31)					
Gross earnings	138,425,808	147,482,033	—6.2	48	49
Net earnings	71,450,209	75,430,775	—5.3	..	..
Eastern Utilities Associates & constituent cos. (Year ended March 31)					
Gross earnings	9,146,091	9,399,140	—2.7	..	..
Net earnings	3,782,843	3,804,134	—0.5	..	..
Engineers Public Service (Year ended March 31)					
Gross Earnings	53,000,231	51,464,589	2.9	..	..
Net earnings	22,586,799	21,945,226	2.9	..	..
Philadelphia Company (Year ended February 28)					
Gross earnings	60,808,256	63,457,731	—4.2	..	..
Net earnings	29,932,914	31,127,551	—3.8	..	..
Public Service of New Jersey & subs.¶ (Year ended March 31)					
Gross earnings	138,527,233	138,764,391	—0.1	68	70
Net earnings	44,044,825	42,643,730	3.3	..	..
Standard Gas & Electric & subs. (Year ended February 28)					
Gross earnings	152,453,072	154,949,828	—1.6	..	..
Net earnings	73,137,506	74,402,644	—1.7	..	..
United Gas Improvement & subs.¶ (Year ended March 31)					
Gross earnings	107,657,883	107,041,996	0.6	58	59
Net earnings	45,946,111	43,241,158	6.2	..	..

* Figures include gas properties to date of sale May 1, 1929.

† Figures include gas properties to date of sale, May 1, 1929. Columbus Elec. & Pur. included from May 1, 1931.

‡ Operating expenses include retirement accruals.

¶ Operating expenses include depreciation.

Business News and Markets

Electrification Order Totals $16,000,000

A TRIBUTE TO THE VISION and courage of the Pennsylvania Railroad in placing an order for $16,000,000 worth of electric railroad equipment at this time was paid by Gerard Swope, president of the General Electric Company, which received a substantial part of the order. Mr. Swope said: "Naturally in these days, when not only large orders but small orders are scarce, we are much gratified in receiving a portion of the order of the Pennsylvania Railroad for electric locomotives, but the placing of this order has greater significance than that, for, evidently, in the estimation of General Atterbury and his associates, development and progress are essential for the Pennsylvania Railroad and for the great territory and population it serves. If it is to give the best service possible it must be equipped with the most modern of instrumentalities.

"For the administration of the Pennsylvania Railroad to do this at this time shows not only vision as to the needs of the future but courage to go ahead now, when it is doubly effective, in putting this new equipment on the Pennsylvania lines on the lowest basis of cost that has been reached in many years, and, secondly, providing work for an additional number of men in various parts of the country, in that way spreading the effective and constructive work they are doing."

The Westinghouse Electric & Manufacturing Company will have a $9,000,000 share in the Pennsylvania Railroad's order for $16,000,000 worth of electric motive power, it was announced by A. W. Robertson, the company's chairman. The total order will be for electrical equipment for 150 locomotives of high speed and power. This is the largest single order for electrical propulsion ever placed, according to Mr. Robertson.

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Standard Symbols for Heat and Dynamics

A NEW AMERICAN TENTATIVE STANDARD, symbols for heat and thermodynamics (Z10c-1931), has been approved by the American Standards Association. The standard is the result of extensive work by the subcommittee for heat and thermodynamics of the section committee on scientific and engineering symbols and abbreviations. This committee co-operated with the International Electrotechnical Commission and with the National Research Council in the preparation of the standard. A tentative list of the symbols was submitted to a subcommittee of the advisory committee on steam turbines of the International Electrotechnical Commission for discussion at a meeting in 1928. A large proportion of the symbols in the list were tentatively adopted at that time by the advisory committee.

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Consolidated Gas Transformer Order

AN ORDER AMOUNTING to nearly $500,000 has been placed with the Westinghouse Electric & Manufacturing Company by the Consolidated Gas, Electric Light & Power Company of Baltimore. This order is for electrical equipment to be used in the super-power system of the Safe Harbor Power Corporation, Safe Harbor, Pa., and the Consolidated Gas, Electric Light & Power Company of Baltimore.

It included four transformers with ratings of 28,000 kva. when self-cooled and 42,000 kva. when cooled with an air blast from Westinghouse hood-type blowers. The transformers are single phase, 60 cycle and step down electricity from 220,000 to 33,000 volts for general use.

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Insulator Line to Meet New N.E.M.A. Standards

TO MEET THE NEW STANDARDS for switch and bus insulators decided upon at the May meeting of the National Electric Manufacturers' Association, the Ohio Brass Company, Mansfield, Ohio, announces a new line ranging in voltage ratings from 7.5 kv. to 69 kv. These new insulators, which appreciably simplify the construction, maintenance and repair problems of the user and make it much easier to co-ordinate line and station insulation, are now available for immediate shipment. Specifications for the new line are as follows:

N.E.M.A. Flashover Requirements

V ating, Kv.	Over-all Height, In.	W Flash, Kv.	D Flash Kv.	Bolt Circle, In.	No. of Tapped Bolt Holes
7.5	7½	35	55	3	4
15	10	50	75	3	4
23	12	70	95	3	4
34.5	15	100	125	3	4
46	18	125	155	3	4
69	25*	180*	220*	3	4

* Stack of 2 insulators.

Wage Cutting Lowers Purchasing Power

The economic effects of wage cutting in industry are thus summarized by an eminent economist:

1. The cuts will not only make an immediate reduction in buying power in direct proportion to the pay curtailment; even more important will be the drastic reaction on the consumer morale of all other wage earners. The fear of possibly wholesale wage cuts will immediately stamp out the awakening consumer interest in buying. Evidence of that awakening is the fact that the April records of department stores showed a higher volume than for any other April in the last five years, though their values were somewhat less because of price cuts.

2. Since wages comprise on the general average about 16.2 per cent of total costs of manufacturing, a 10 per cent cut in wages will mean only about a 1.6 per cent cut in cost.

3. The most usual argument advanced in favor of wage cuts is that the "wage earner must take his share of the deflation." As a matter of fact, there is no evidence to prove that wages have been inflated. In fact, based on a 1921 index of 100, real wages per hour in all non-agricultural pursuits had climbed very gradually up to 113 in 1929. Meanwhile, however, the value added to products by manufacturing—in other words, the return to industrialists—had risen to 172 in the same year. The most striking figure, however, is that of the advance made by dividends (industrial and rail) which rose by 1929 on the same index to 356, and went soaring on upward in 1930, while wages were already beginning to disappear through payroll cuts, up to 397. It is true there has since then been a drastic wiping out of dividends, but the wage earner has had nothing whatever to show in the way of a comparable inflation of his earnings during the boom. Even if we count in the increase in real wages since 1929 due to price changes, the result on the curve will show but a very small upward tilt.

Merger Planned for Lamp and Radio Companies

BOARDS OF DIRECTORS of Sylvania Products Company and Nilco Lamp Works, Inc., Emporium, Pa., and Hygrade Lamp Company, Salem, Mass., have drawn up plans for consolidation. Recommendations of the three boards will be put before the stockholders for official ratification in the near future.

Combined sales of these companies amounted to approximately $9,000,000 for the year 1930. The Emporium and Salem units each manufactures incandescent lamp bulbs and tubes. The electric lamp bulbs are manufactured and sold under a license agreement with the Generel Electric Company. The Sylvania Products Company and Nilco Lamp Works, Inc., together do about the same volume of business as the Hygrade Lamp Company.

This consolidation will be effected without resorting to additional public financing. No new management or financial interests are involved in this consolidation and those officers who have been in charge of the separate businesses will continue with the new combination. No change is contemplated in the manufacturing facilities or locations.

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Canal Electrification Progressing in France

IN A RECENT ISSUE of "Science and Industrie" M. G. Soleil describes the work of electrification of the St. Quentin Canal, which comprises a 1½-mile section between Elrun and Cambrai, of one of 58 miles between Cambrai and Chauny and one of 21¼ miles between Chauny and Janville. The object of the electrification is to increase the traffic capacity of this important navigable route which connects the industrial region of the north of France with the eastern districts and the Paris area.

The electrification work comprises the substitution of haulage by electric tractors along the banks for horse or manual haulage, electrification of the towboats which haul the chains of barges in the sorting reaches where the circulation is unidirectional, installation of electric and automatic drive for the opening and closing of the lock gates and their sluice valves, installation of remote control for the lock tractors in view of increasing the rapidity of the entrance and the exit of the barges in the lock chambers. The first two sections of the work have already been completed. Electrification of the whole of the controls of the gates and sluice valves and the remote control of the lock tractors in the southern section of the canal between Janville and Chauny are expected to be completed before the end of the present year. The tractors are fed from overhead conductors carrying d.c. at 600 volts converted from 15,000-volt, 50-cycle, three-phase a.c. at substations along the canal. Altogether 360 tractors are now in use, they being each fitted with a 16-hp. series motor.

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New York Metal Prices

	May 27, 1931 Cents per Pound	June 3, 1931 Cents per Pound
Copper, electrolytic	8.50	8
Lead, Am. S. & R. price	3.75	3.75
Antimony	6.40	6.30
Nickel, ingot	35	35
Zinc, spot	3.60	3.60
Tin, Straits	23	22.40
Aluminum, 99 per cent.	23.30	23.30

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EXPORTS OF ELECTRICAL EQUIPMENT (PRELIMINARY)

Article	March 1930	March 1931
Generators:		
Direct current—		
Under 500 kw.	73,865	46,533
500 kw. and over	69,385	65,198
Alternating current—		
Under 2,000 kva.	46,144	12,905
2,000 kva. and over	116,121	.....
Steam turbine generator sets	24,783	51,361
Accessories and parts for generators	75,046	49,452
Arc welding sets	20,448	60,430
Self-contained lighting outfits	100,292	19,779
Batteries:		
6-volt storage batteries	157,688	101,391
Other storage batteries	106,900	71,562
No. 6 dry cell batteries	50,861	35,906
Flashlight batteries	287,722	247,941
Radio B and C batteries (dry)	63,963	31,111
Other dry and wet cell primary batteries	33,271	14,179
Transforming or converting apparatus:		
Power transformers, 500 kva. and over	198,709	52,242
Distribution transformers, less than 500 kva.	252,367	93,980
Instrument transformers	15,893	13,267
Other transformers	213,662	44,920
Complete battery chargers under 15 amp.	14,239	9,198
Double-current and motor generators, dynamotors, synchronous, and other converters	135,568	121,172
Transmission and distribution apparatus:		
Switchboard panels, except telephone	162,177	324,291
Power switches and circuit breakers over 10 amp.	299,801	81,290
Fuses	34,085	22,193
Watt-hour and other measuring meters	55,419	72,828
Electrical indicating instruments	108,176	49,118
Electrical recording instruments	46,110	26,542
Other electrical testing apparatus	65,473	59,945
Lightning arresters, choke coils, reactors, and parts	43,883	64,853
Motors, starters, and controllers:		
Motors, ¼ hp. and under	226,372	120,115
Motors, over ¼ and under 1 hp.	64,330	30,252
Stationary motors—		
1 to 200 hp.	341,204	143,603
Over 200 hp.	61,021	13,335
Railway motors	57,437	3,800
Electric locomotives—		
Railway	94,138	.....
Mining and industrial	44,211	40,140
Station and warehouse electric motor trucks	36,610	25,313
Starting and controlling equipment—		
For industrial motors	140,971	108,756
For electric railway and vehicle motors	17,718	4,736
Portable electric tools	117,496	52,877
Accessories and parts for motors	253,850	106,240
Electric refrigerators and parts:		
Household	1,009,074	801,178
Commercial up to 1 ton	236,249	224,661
Parts for electric refrigerators	.....	331,410
Electric appliances:		
Electric fans	123,941	44,446
Electromechanical health exercisers	15,569	5,293
Electric incandescent light bulbs—		
For automobiles, flashlights, and Christmas trees	16,909	12,833
Other metal filament	94,161	54,928
Other electric lamp bulbs	54,908	9,910
Flashlight cases	156,857	45,877
Searchlights and floodlights	40,157	16,434
Electric household washing machines	165,880	80,319
Electric domestic vacuum cleaners	88,530	99,977
Other domestic motor-driven devices, except tools	53,309	48,828
Electric flatirons	31,164	19,544
Electric cooking ranges	26,489	37,008
Other domestic heating and cooking devices	88,599	82,215
Industrial electric furnaces, ovens, and other heating devices	149,324	35,520
Therapeutic and x-ray apparatus	148,082	95,590
Signal and communication devices:		
Radio apparatus—		
Transmitting sets, tubes and parts	75,553	92,978
Receiving sets	676,488	916,923
Radio receiving tubes	192,232	127,226
Receiving-set components	188,910	230,824
Loudspeakers	126,352	111,174
Other receiving-set accessories	68,123	67,163
Telegraph apparatus	54,394	39,282
Telephone apparatus—		
Telephone instruments	62,062	56,512
Telephone switchboards	206,865	37
Other telephone equipment	477,557	190,797
Bells, buzzers, annunciators and alarms	18,661	55,767
Other electric apparatus:		
Spark plugs	206,744	93,441
Other starting, lighting, and ignition equipment	160,275	36,739
Insulating material	159,179	55,099
Metal conduit, outlet, and switch boxes	107,530	72,195
Sockets, outlets, fuse blocks, and lighting switches	185,755	120,677
Electric interior lighting fixtures	217,785	153,186
Electric street lighting fixtures	29,370	35,495
Other wiring supplies and line material	132,368	108,072
Other electric apparatus, n.e.s.	1,146,639	442,470
Rubber and friction tape	29,885	35,047
Globes and shades for lighting fixtures	58,332	49,643
Glass electric insulators	33,000	11,268
Electrical porcelain:		
For less than 6,600 volts	45,930	27,906
For 6,600 volts and over	87,965	73,179
Carbons and electrodes:		
Electrodes for electric furnaces	200,482	106,595
Other carbon products	63,174	45,089
Insulated iron or steel wire and cable	39,321	10,492
Copper, bare wire	649,888	88,115
Insulated copper wire and cable:		
Rubber-covered wire	94,118	44,718
Weatherproof wire	15,745	46,180
Telephone cable	15,355	6,215
Other insulated copper wire	377,349	171,856
Nickel-chrome electric resistance wire	.....	10,123
Totals	$13,029,997	$8,271,208
Three months ended March 31	$37,174,793	$23,473,980

Market Conditions

EQUIPMENT buyers continue to take only necessities and are buying on a strictly hand-to-mouth basis in most parts of the country. In the Eastern and Pacific Coast districts, however, there seems to be a slow but sure week-to-week improvement, both in actual purchases and in inquiries.

——NEW CONSTRUCTION IS ACTIVE ON THE Pacific Coast and new lighting developments are giving rise to a fair volume of business.

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PACIFIC COAST

—MAY BUSINESS *is reported by wholesalers as running close to April volume, which is subnormal. An encouraging feature is the larger proportion of standard construction and sales of staple items.*

—INDUSTRIALS ARE *apparently beginning to purchase again, not only wiring maintenance material, but also such machinery as a $20,000 General Electric automatic welding unit, sold to the pipe company which received the award for the Hetch Hetchy pipe line. Seven variable-speed motors 40-10 hp. with controls valued at $8,000 were sold to a Hawaiian sugar mill and a 525-kva. generator and control equipment valued at $7,500 to an automatic hydro plant for an Idaho mine.*

Other special orders cover 4,500 assorted crossarms and four 36-kva., 5,000-volt induction feeder regulators for Los Angeles, 20,000 ft. of three-conductor cable, sizes No. 6 to 2/0, for the United States government, and a quantity of service switches and primary cutouts for the same, 10,000 ft. of No. 19 gage and 20 pairs of lead-covered cable for Los Angeles. Considerable constructive illumination work has borne fruit in the recent opening of two cafes, featuring their decorative lighting installations. Also many poultry plants are experimenting with the ultra-violet lamps, although not yet at the buying point. Two $1,000,000 racing plants are being considered for the Bay area, which, coupled with bridge activity covering $100,000,000 worth of construction and two $5,000,000 government plants for dirigibles and a bombing base, are expected to improve the retail business in the Bay area. The outstanding major construction project for the week is a food product plant near Los Angeles aggregating $10,000,000, for which construction will begin in September. The outstanding order for the week covers $35,000 worth of Westinghouse control and motor equipment for four steam shovels for use on the Hoover Dam.

Motor and apparatus sales in Seattle and the Puget Sound district continued light last week, although an increase in buying from lumber mills and allied woodworking plants, mainly for replacements, was noted. Inquiries from these sources, also, it was stated, are showing constant increase. Range sales for the first five months of the year are reported 20 per cent off over last year, domestic appliances 50 per cent off and radio 75 per cent off. Puget Sound Power & Light Company bought six months' supply of bare and weatherproof copper wire, totaling 700,000 lb., for extensions throughout the district from the General Cable Corporation, and this public service company is now negotiating for the purchase of a 15,000-kva. condenser for installation at Beverly Park, near Everett, the apparatus to cost around $125,000. Motor sales reported include 40 machines from 50 hp. down to lumber and pulp mills and miscellaneous industrials, about 60 to similar sources by another jobber, 15 machines from 75 hp. down to dealers, three 50 hp. to a pulp and paper mill and 25 machines from 20 hp. down to fruit canneries and irrigation districts. About 50 transformers ranging from 10 to 37½ kva. were sold to local power companies and three of 50 kva. to the McNeil Island federal penitentiary. A resolution providing for the sale of $2,000,000 worth of Seattle lighting bonds to finance purchases and construction in connection with the Diablo hydro-electric project and improvements to Seattle substations is before the Seattle City Council.

CONSTRUCTION PROJECTS

RKO-Pathe Studios, Culver City, Calif., has plans for two film laboratories to cost over $250,000. Los Angeles, Calif., will receive bids until June 16 for distribution and small power transformers as required for period of one year (Specification 2459). Oakland Laundry Company, Oakland, Calif., plans plant to cost $225,000. University Hotel Garage Corporation, Seattle, Wash., plans multi-story garage to cost over $100,000. Rainier Pulp & Paper Company, Shelton, Wash., contemplates extensions and improvements in mill, reported to cost over $250,000. Department of Commerce, Washington, D. C., will receive bids until June 15 for installation of lighting facilities on Kingman-Winslow, Ariz., section of Los Angeles-Amarillo Airway (Proposal 23350).

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SOUTHWEST

—NO APPARENT CHANGE *has been noted in general business conditions. General orders throughout this district seem to be, "don't buy unless you have to." This covers both utilities and industrials.*

Orders reported include a lot of material for modernizing street cars, principally improving air brake equipment, costing $12,000; a 250-hp. synchronous motor for driving paper mill machinery, worth $3,200; iron-clad switchgear for a local company totaling $4,000, and a miscellaneous lot of distribution transformers aggregating $5,000.

CONSTRUCTION PROJECTS

Tulsa State Fair Association, Tulsa, Okla., has plans for new buildings at exposition grounds to cost $150,000. Houston Salt Company, Houston, Tex., contemplates extensions and improvements in plant at Hockley, Tex., to cost over $100,000. Master Petroleum Company, Waco, Tex., has plans for an oil refining plant at East Waco, to cost close to $100,000. County Auditor, Dallas County, Dallas, Tex., will receive bids until June 18 for lighting system for Dallas-Oak Cliff viaduct.

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NEW ENGLAND

—BUSINESS CONDITIONS *in this district continue to indicate that buying is cautious and inquiries for future needs on hand among departments of prominent manufacturing companies are relatively few in so far as large orders of heavy equipment are concerned.*

—BUYING TRENDS SHOW *slow but steady buying of small motors and occasional single orders for large motors, switch and control equipment.*

Central-station supplies are quiet. One manufacturer recorded the sale of an 8,000-kva. transformer for use in a New England plant during past week. Line materials are in light demand, although elimination of overhead lines and substitution of underground distribution is planned for one Massachusetts municipality. Specialties, on the other hand, show interesting progress. Refrigerator sales for Boston during the year to May were 5,700 and about 30

per cent of the entire New England quota has been placed to date. Commercial electric cooking ranges are attracting interest. Recent changes to this type of equipment include installation at a prominent college, a Massachusetts hotel and highway lunch stands. New construction projects include a $3,000,000 publishing plant for the Christian Science Publishing Society.

CONSTRUCTION PROJECTS

Eastern Massachusetts Street Railway Company, Boston, Mass., has filed plans for mechanical shops at Melrose, Mass., to cost $100,000. Northeastern Storage & Distributing Corporation, Worcester, Mass. will take bids on revised plans for a new plant to cost about $850,000. Lux Clock Company, Waterbury, Conn., contemplates an addition to cost over $75,000 with equipment.

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EASTERN

—A LEADING MANUFACTURER *of electrical machinery in the Eastern district sums up the situation by saying that gradual market improvement is being shown from week to week and that the return to better business seems definitely on the way.*

—ELECTRIC RAILWAY ACCOUNT *is a primary factor in current commitments and a record order for electric locomotives, approximating $16,000,000, tops off recent heavy business for other equipment from that quarter; further buying of accessory apparatus is looked for.*

—CENTRAL-STATION DEMAND *continues subnormal for this time of year, with industrial call following the same trend; only a few of the key industries are active in the market for requirements. Government purchases are helping the immediate situation.*

Said to be the heaviest order for electrical propulsion equipment ever placed at one time, the Pennsylvania Railroad Company has given contracts for 150 electric passenger and freight locomotives, totaling $16,000,000, divided between the General Electric Company and Westinghouse Electric & Manufacturing Company. Of the total noted, 90 units will be for fast passenger trains and 60 for high-speed freight service on the New York-Washington, D. C., electrified system; 43 of the locomotives are scheduled for delivery this year. The railroad will purchase 80 additional electric locomotives at a later date.

The Reading Railway, another prominent factor in electrification work in past months, has active construction in progress on the completion of its program in the Philadelphia and Trenton districts, involving a gross investment of $21,500,000. A main power substation has been completed at Wayne Junction and erection is under way on a group of outlying substations; equipment will be installed in the near future. Catenary system construction is being advanced in the different sections of the route. Orders have been placed for a quantity of machinery for the electric shops at Wayne Junction. A total of 24 companies have submitted bids to the Port of New York Authority for electrical equipment for the new George Washington Bridge over the Hudson River, between New York and Fort Lee, N. J., now in course of building, the quotations ranging from $75,480 to $156,635. The Beach Electric Company, Newark, N. J., has tendered the low proposal. A central station in Connecticut has purchased a turbo-generator unit from a New York maker, totaling $175,000.

CONSTRUCTION PROJECTS

Diamond Match Company, New York, contemplates construction of new potash manufacturing plant to cost over $500,000. Board of Education, New York, has authorized plans for a vocational school at St. George, S. I., to cost about $1,000,000. Signal Supply Officer, Army Base, Brooklyn, N. Y., will receive bids until June 10 for quantity of terminals, plugs, resistors and other electrical supplies (Circular 176). American Maize-Products Corporation, New York, contemplates corn products manufacturing plant at South Gate, near Los Angeles, Calif., to cost over $1,000,000. Ford Motor Company, Highland Park, Mich., contemplates assembling plant at Buffalo, N. Y., to cost over $500,000. Beatrice Creamery Company, Chicago, Ill., plans expansion program at plant at Brooklyn, N. Y., to cost over $75,000. Supervising Architect, Treasury Department, Washington, D. C., will receive bids until June 12 for an electric distributing system and submarine cable at Reedy Island, Del. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until June 16 for one Diesel engine-generator set and spare parts for submarine base (Schedule 5821). Allegheny Refineries, Inc., Bolivar, N. Y., has plans under way for an oil refining plant to cost close to $100,000.

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SOUTHEAST

—BUSINESS IN THE *Southeast remains very quiet, with nothing but purchases of a routine nature being made. However, the volume of inquiries shows some increase and this, with the volume of pending business, seems to indicate an accelerated movement in the next few months.*

A Florida power company last week ordered 63,000 lb. of bare and weatherproof copper, while three 833-kva. transformers and $3,460 worth of distribution and small power transformers were purchased for a Georgia company. Another order from Georgia was for $4,500 worth of time switches as a result of the electric water-heater sales activities of one of the larger companies. Some other central-station orders were for $2,065 worth of street-lighting equipment and $1,220 worth of house type meters. A sand and gravel company in the New Orleans section ordered a 350-hp. slip-ring motor and control and the federal penitentiary at Atlanta ordered ten 100-kva. transformers and some other small transformers, the latter order amounting to approximately $4,000.

CONSTRUCTION PROJECTS

Edwin M. Knowles China Company, Newell, W. Va., has authorized an expansion program at pottery to cost over $200,000. Virginia & Pittsburgh Coal & Coke Company, Fairmont, W. Va., contemplates a tipple at Morgan Mine, reported to cost over $70,000. Southern Industries & Utilities, Inc., Chattanooga, Tenn., W. G. Waldo, Chattanooga, engineer in charge, has secured preliminary permit for hydroelectric power plant on Lower Tennessee River, entire project to develop 94,000 hp., and cost over $25,000,000.

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MIDDLE WEST

—SOME SLIGHT CHANGES *in general business conditions in the Middle West section were noticeable the last week in May. The volume of business continues substantially the same as last week, but a few more favorable indications are being observed.*

While general business is admittedly slow and the trend considerably mixed, a feeling of confidence seems to be slowly returning. The major activities continue in relatively the same position. A welcome increase in inquiries for electrical equipment and apparatus is observed. Some of the interesting items placed this week include 75 600-amp., 15-kv., single-pole, single-throw, wheel-mounted, solenoid-operated oil circuit breakers, six 1,200-amp., 69-kv. single-pole, single-throw, frame-mounted, solenoid operated, 1,000,000-kva. interrupting capacity oil circuit breakers and five 600-amp., 15-kv., single-pole, single-throw, Deion circuit breakers.

CONSTRUCTION PROJECTS

Duluth, South Shore & Atlantic Railway Company, Duluth, Minn., has authorized construction of ore dock and ore storage and distributing plant at Marquette, Mich., to cost about $1,500,000. Garrett, Ind., will soon take bids for an addition to power plant. Board of School Commissioners, Indianapolis, Ind., will receive bids until June 9 for two automatic underfeed stokers. University of Notre Dame, South Bend, Ind., has plans for a power plant, reported to cost over $65,000. Addressograph-Multigraph Corporation, Cleveland, Ohio, will take bids for addressing and printing machinery plant at Euclid Village, including power plant, to cost $1,000,000.

New Equipment Available

Improved Pole Mount

THE LINE OF POLE MOUNTS manufactured by Nepsco, Inc., Newton Lower Falls, Mass., has been enlarged by a design in which precast concrete bases prepared in the factory take the place of concrete piers poured in the field and

in which longer supports are now available for both driven and precast work. These devices are built to extend the field service of poles after ground decay has necessitated shortening them. The malleable-iron supports are clamped to the pole and the support lengths and pier diameters available have been increased sufficiently in number to meet a variety of field conditions. Where the driven type of installation is not selected, the use of precast piers facilitates more rapid construction than the former method of pouring concrete on the ground.

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Lighting and Violet Ray Equipment in One Fixture

A LINE OF EQUIPMENT known as duo-purpose fixtures, embodying lighting and violet ray functions, has been placed on the market by the Miller Company, Meriden, Conn. The ordinary "Mazda" lamps furnish illumination for general lighting purposes and in another circuit of the fixtures a new General Electric S-1 "Mazda" sun lamp for ultra-violet radiation is used.

This new light source is a combination tungsten filament and mercury-vapor arc. It requires a special transformer properly to start and maintain the arc. The bulb of the lamp is of a special glass, corex D, that transmits ultra-violet light of a predetermined quality. Lighting fixtures designed to employ this S-1 sun lamp will thus produce artificial illumination of a quality closely approximating sunlight from the standpoints of vision and health.

The fixtures are scientifically designed to direct and control the ultra-violet radiation of the General Electric "Mazda" sun lamp to produce the most healthful, beneficial results. Their design also embodies the use of "Mazda" lamps to produce efficiently illumination for visual purposes.

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Heat Dissipated in High-Intensity Lamp

A NEW TYPE OF high-intensity incandescent lamp which eliminates three-fourths of the heat, with negligible loss of light, has been developed by the General Electric Company. There are numerous applications where intense illumination with a minimum amount of heat is required, such as over operating tables in hospitals, in lighting wax models and other objects in store window displays and in opaque projection.

The elimination of the heat is accomplished by absorbing the heat rays in a liquid surrounding the bulb. Distilled water, a solution of copper chloride and some other solutions will absorb heat while transmitting most of the light. The heat is conveyed away from this solution by means of a cooling coil through which water is circulated.

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Impulse Type Totalizing Meter

A TWO-CIRCUIT TYPE RA impulse totalizer operated by impulses produced by means of three-wire contacts in individual watt-hour meters of the ordinary type, in which simple contact mechanisms are added, has been announced by the Westinghouse Electric & Manufacturing Company.

Mechanical difficulties in older designs limited the circuits that could be totalized in one assembly to eight. With this design units may be cascaded indefinitely. It is claimed that this apparatus is not only more simplified in construction and more reliable and economical in operation but is also considerably lower in price than former impulse equipment. The cost is considerably reduced by the elimination of many of the auxiliary devices required for d.c. operation.

The receiver may be in the form of an RA recording watt-hour demand meter where a graphic record of the demand is required or it may be simply an indicating watt-hour demand meter where indications only will suffice.

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Dustless Portable Sanding Machine

A NEW MODEL SANDING MACHINE, known as type B-10 dustless take-about sander, has been announced by the Porter-Cable-Hutchinson Corporation, Syracuse, N. Y. This model has eliminated the difficulty of controlling the dust by a special dust-removal system built into the machine. A double blade fan traveling at 10,000 r.p.m. creates a powerful vacuum which draws the dust through ports directly in back of the rear pulley and deposits it in the bag. Dust is removed from the bag through the zipper opening.

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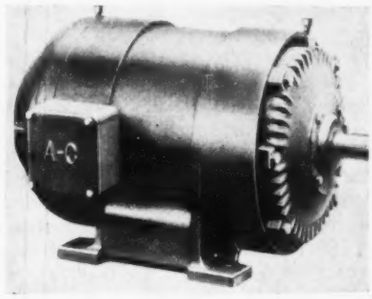
Explosion-Proof Motor for Hazardous Atmospheres

A LINE OF EXPLOSION-PROOF MOTORS that is approved for use in hazardous atmospheres such as are encountered in oil refineries, gasoline plants, dry cleaning plants, etc., has been announced by the Allis-Chalmers Manufacturing Company. These motors have been tested and approved by the Underwriters' Laboratories.

The construction of this explosion-



proof motor is along the same general lines as the Allis-Chalmers totally inclosed, fan-cooled motor, having the same design, with all parts readily accessible. Its special features include extra-long-bearing seals to prevent the escape of flame and to cool the gases below the point of ignition, special alloy steel cap screws that fit into tapped pockets, and unusual sturdiness safely to resist stresses due to possible internal explosions or flashes. In addition to the sealed motor leads, a special explosion-proof cast-iron conduit box gives additional protection against possible contact with surrounding air.